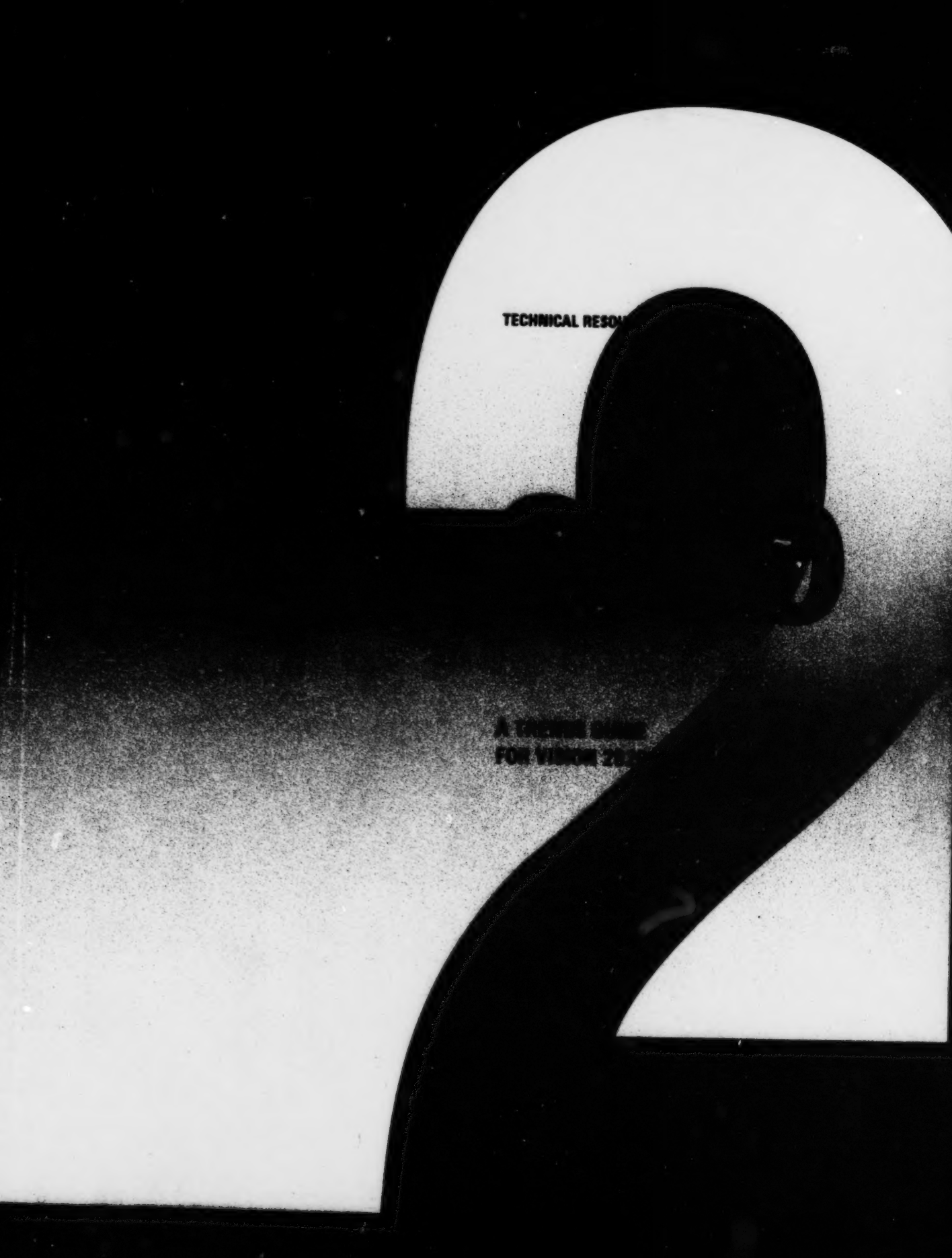
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FOREWORD

Trends tell you the direction the country is moving in. The decisions are up to you. But trends, like horses, are easier to ride in the direction they are already going. When you make a decision that is compatible with the overarching trend, the trend helps you along. You may decide to buck the trend, but it is still helpful to know it is there.

John Naisbitt, Megatrends

This document consists of a selection of trends that are considered to be of interest to municipalities in Alberta. Municipalities should be aware that the choice has been made from a wide range of respected sources, but it is still a choice. A selected bibliography is attached.

Readers should also be aware that the literature on Futures is very extensive. Municipalities and individuals may know of publications containing trends that are not emphasized in this Guide. They are urged to include them in their deliberations of their municipality's future and to draw them to the attention of the Vision 2020 team.

The fact that certain trends are included in this guide does not imply any certainty or assurance that they will actually come to pass. The Government of Alberta, the Department of Municipal Affairs and other participating Departments make no guarantee of the viability or likelihood or occurrence of any of the trends referenced in this Guide. Likewise, the contents of this Guide should not be construed as policy of the Government of Alberta.

INTRODUCTION

A. Purpose and Organization

This Technical Resource provides VISION 2020 participants with a relatively detailed review of trends that are expected to play a part in shaping the future of Alberta communities. It supplements the Compendium of Trends Selected by Agencies of the Alberta Government (Technical Resource #3) and is intended to be used by participants seeking more information than is contained in the Trends Summary included in the Vision 2020 "Discussion Guide".

The trends included here were selected from a number of sources: books, journals, newspapers, government publications and Technical Resource #3. Additional advice was obtained from a number of expert futurists, Roger Goodman, Steven Ames, Louis Dernoi, Roger Goodman, Michael Hollinshead and Ruben Nelson. Two broad categories of trend are presented: (i) "background trends" which relate to the physical, social and economic setting in which Alberta communities exist and (ii) trends which will affect Alberta communities more directly. Because no municipality or community functions in complete isolation from the outside world, changes elsewhere or throughout society in general cannot be ignored; some will inevitably affect the life of the community or the operation of municipal government.

As an example of a background trend, the average age of the Canadian population is rising, with many potential ramifications for communities generally. Individual Alberta municipalities could be affected if there is a resulting growth in local demands for services required by or suited to older residents.

For purposes of presentation, the trends are organized as far as possible according to the major topic headings of the Discussion Guide; people and values, economic and social opportunities and physical and functional.

The detailed chapter heads can be found in the Table of Contents. This arrangement is preceded by a discussion of the nature of trends and a special section on technology.

This document is a selection of trends and is not intended to be a comprehensive review of all the trends expected to have a direct or indirect bearing on the future of Alberta communities. The trends selected may impact different municipalities differently.

Participants in VISION 2020 will have to be the ultimate judges of the relevance and relative importance of the trends presented for consideration.

SUMMARY

SUMMARY

INTRODUCTION

The future of Alberta communities could be affected by two general categories of trend: (i) background trends relating to the physical, social and environmental setting in which the communities exist and (ii) trends which will have a direct effect on the communities. Background trends must be considered because no community functions in isolation from the outside world. This Technical Resource discusses trends of both types but concentrates on those felt likely to be among the most significant to early twenty-first century life. However, each trend may not become evident to the same extent in every municipality in Alberta.

TRENDS AND TECHNOLOGY

THE NATURE OF TRENDS

Trends provide guidance about the many changes taking place over time. A broad appreciation of the changes occurring in all areas of life helps in determining what is important and what is not.

Once the reasons for change are understood, change will be easier to accept; better forecasts of implications and impacts will be possible.

Some trends are so fundamental that they underlie and appear in all areas of life: so-called "mega-trends" or "meta-trends". These include a growing acknowledgment of the reality of change and the need to adjust and adapt; the increasing recognition that all things are interrelated and cannot be dealt with in isolation; the increasingly widespread availability of information; the growth in the complexity of society; and a growing acceptance of the fact that society is undergoing a slow but very fundamental long-term transformation.

Technical change tends to be uneven over time. Clusters of technical innovations of wide adaptability can be catalysts for sustained economic growth. Recent technologic changes suggest that the next twenty years could lead to unparalleled change and economic development.

Conventional materials are being threatened by substitutions of a new array of complex and exotic materials such as polymers (plastics), composites, advanced ceramics and metallic superalloys. The wave of the future may be the new space-age materials.

Plastics may incorporate high strength, high temperature resistance, high mechanical stress and solvent resistance and are likely to be the all-pervasive material beyond the turn of the century, particularly if non-degradability drawbacks can be overcome.

Composites - combinations of materials consisting of fibres and binding agents - will fill high-performance functions in the automobile, consumer and furnishing industries. Ceramics are also expected to emerge as a major growth industry.

Biotechnology has been building a foundation for commercial products in human health, animal and plant biotechnology.

Supercomputers and miniaturization are expected to make significant gains, leading towards artificial intelligence. Robotics will proliferate throughout the resource and manufacturing sectors.

Beginning in the 1990s, integration of technologies will produce a merging of microelectronics and telecommunications. Fibre optics will be the catalyst to this development.

Electrotechnology, thermo-mechanical pulping and superconductivity are all areas where significant scientific breakthroughs are anticipated.

Hydrogen, produced by passing electricity through water, could become a major fuel source and be the ultimate non-pollutant, releasing only water vapour after combustion.

The dawning of the Information Age will bring in its wake a wave of new, knowledge-intensive industries, with profound social and economic implications flowing from their development.

POPULATION AND SOCIAL TRENDS

Population

Globally, population is growing rapidly in less developed countries as death rates fall but birth rates remain high. In developed countries, the population is levelling off because falling death rates have been accompanied by falling birth rates. The likely outcome will be a very youthful Third World and an aging population in the more developed countries.

The rate of population growth in Canada will slow over the next fifty years until the total population stabilizes between 26 million and 33 million some time between 2000 and 2020. The number of Canadians under 18 years of age may decrease while people of working age may also decrease following a period of growth ending in the second decade of the new century. Over 65s will grow numerically to such an extent that they may account for 18 percent of the Canadian population in 2016.

The Alberta population may grow from a 1986 figure of 2.4 million to between 2.9 million and 4.0 million by 2016, reflecting an annual rate of increase between 0.7 percent and 1.6 percent, significantly lower than in the past three decades.

The population living in rural areas and urban communities of under 1,000 population could account for less than 14 percent of the provincial population in 2001, compared to 23 percent in 1981. However, there are a number of counter-trends which could result in rural repopulation. It is clear that individual communities can influence the course of their own population changes through local initiatives in quite a major way. Regardless of urban or rural character, all areas of the province are expected to experience a decline in fertility rates and an aging of the population.

By the year 2016, the percentage of Alberta's population over 65 years of age is expected to have risen from 8 per cent to 16 per cent, with the number of seniors more than doubling. The working age population will account for a constant percentage of the population but the elderly dependency ratio will increase while the child dependency ratio will decrease. The aging phenomenon may be less apparent among the Native population because of a higher fertility rate and a higher mortality rate than among non-Natives.

In the face of the low levels of natural increase, the growth of the Alberta population will be largely determined by the magnitude and character of migration movements. Interprovincial migration will likely continue to be greater than international migration but the latter will grow in importance.

Social

The average size of the Alberta family is decreasing due to the lowering of the birth rate and increases in numbers of childless families, single parent families and single person families. The average is expected to decline further, from 3.2 persons in 1986 to 2.48 persons by 2006.

The marriage rate in Alberta will stabilize if fewer divorced people seek to re-marry. The divorce rate is expected to show a slight increase. The numbers of singles and single parent families will increase. Along with a rising rate of female participation in the labour force, the changes in family structure will likely result in an increased number of 'latchkey' children and an increased demand for day care.

Education

Courses offering currently demanded job skills are becoming more popular. Retraining will be required as a result of technological and structural changes in the economy.

The school-age population is projected to decline but the total enrolment in primary and secondary schools is projected to increase; students may stay in school longer to improve their chances of entering higher education and/or employment. The concept of "lifelong education" might initiate a growing demand for adult education.

A long-term trend of rural school closure and centralization may continue if rural-urban migration continues to cause rural depopulation. Similarly, more downtown schools in larger centres may have to be closed due to the lack of a local school-age population.

Study at home could become more feasible with the advent of sophisticated distance learning techniques employing advanced computer and telecommunications technology.

Health

Increasing emphasis may be placed on health prevention, both to promote "wellness" through self-help and to control or avoid the costs of treating patients suffering from an unhealthy lifestyle or environment. In Alberta, government will be placing more emphasis on health promotion, illness prevention and community care in a deliberate effort to move away from a stress on institutional and clinical care.

LABOUR MARKET

The demand for labour in developed countries including Canada will be affected by three contemporary trends: the global restructuring of economic production, the lowering or removal of international trade barriers and the emergence of new technologies. The supply will be affected by the aging of the population, the lowering of fertility rates and changes in the level of labour force participation. In Alberta, the participation rate has been rising and may continue to do so if families need two incomes, labour shortages occur and/or more women seek employment.

The nature of the employment available in Alberta has been changing. Since the mi[illegible]Os, the number and proportion of tertiary (service) industry jobs have risen while primary (agriculture, forestry and extractive) and secondary (manufacturing) jobs have increased numerically but declined in share of the labour force. However, not all the industries falling within each of these sectors have changed in identical fashion to the sector as a whole. The percentage of jobs which are part-time has grown from 12.3 percent in 1975 to 16.8 percent in 1988.

New skills will have to be acquired if the labour force is to participate in activities based upon the development or application of new technologies. A rising level of educational attainment in Alberta should facilitate this task.

ECONOMIC AND SOCIAL OPPORTUNITIES

GLOBAL TRENDS

The world's economies are becoming increasingly interdependent (globalization) in an ever more complex fashion. A global redistribution of labour and production is under way, giving rise to an integrated system of world-wide production.

A growing number of Third World countries are manufacturing for export, altering the pattern of comparative advantages in world manufacturing industries. Multinational firms are organizing their production activities globally. World trade is being liberalized. International economic alliances are becoming accepted and can be expected to be further refined.

Developed countries are undergoing a transition from being industrial (manufacturing) societies to societies based on the development, exchange and application of information. Advances in computing and telecommunications technology are accelerating this process. Information-related jobs have accounted for much of the increased tertiary sector employment in developed countries. This increase has

resulted in the overwhelming majority of tertiary workers now being employed in functions related to the creation, processing and distribution of information. Corporate organizational structure based on a hierarchy of authority is being modified to take account of the patterns of information flow resulting from applications of new technology.

CANADIAN TRENDS

Much of the new work created in Canada over the next 30 years will be concerned with the collection, storage, evaluation and dissemination of information.

Manufacturing is becoming relatively less important as an employer in developed countries. This is because the increased use of sophisticated technology is replacing labour and at the same time, service employment is growing. However, the level of output is stable or growing. Trend reports for Canada indicate that resource extraction and processing will continue to decline while fabricating will be more resilient. New information-based services and industries are expected to provide new employment opportunities.

Alberta

(a) Economy

In Alberta, agriculture has traditionally been subject to changing fortunes but there are long-term trends: decreases in farm numbers and farm population; increases in average farm size and number of farm families taking off-farm employment. Agricultural production appears likely to become even further concentrated in the hands of efficient, large-volume farms. To be successful, farms may have to be operated as agribusinesses in order to compete in a global environment where traditional export markets are no longer guaranteed.

The future of Alberta's energy industry will depend very much on world prices and the size of the remaining reserves. One projection suggests

that conventional oil production will gradually decline over the remaining years of the twentieth century while production of raw bitumen (the raw material of synthetic crude oil) will gradually increase.

Natural gas production is projected to increase rapidly through the 1990s but begin to decline after 2002 due to reduction of reserves. As a result of increased Alberta demand for electricity and increased exports of bituminous coal to central Canada and the Pacific Rim, coal production is expected to rise slightly.

About a twelfth of the province's labour force is classified as employed in manufacturing in such industries as food processing, oil refining, petrochemicals, pipelines, oil industry equipment, clothing and high technology. More industries will be established if efforts to diversify the economy prove successful.

Geographically, the province's manufacturing is primarily concentrated in Edmonton, Calgary and several other urban centres. This pattern may change if industries requiring few local industrial linkages can set up in other communities as a result of the locational flexibility allowed by advanced telecommunications technology.

Most working Albertans are employed in tertiary activities of one form or another. In the 1960s and 1970s, much of the growth in tertiary employment was due to public sector employment growth. Future growth may be due more to growth in retail employment, financial services and high-tech services.

Retailing is the most widely distributed tertiary activity but the sizes and types of store vary among different sizes of place. Between 1977 and 1985, the number of retail outlets in most Alberta communities increased. The places making the largest gains lay within the Calgary-Edmonton corridor and other major transportation corridors. The communities experiencing below-average growth in outlets tended to be agricultural service centres in prairie Alberta outside the Calgary-Edmonton axis. Some of the province's smallest centres experienced an absolute loss in number of outlets.

Tourism in Alberta may be affected by several global and continental trends. Travel between the western world and east Asia for business and leisure purposes is growing. The desire to visit non-urban environments is becoming a more important factor in influencing people's selection of vacation destinations. People's desire to travel by road shows no sign of diminishing.

Locally, the accommodation and food service industries may experience labour shortages as the number of young people in the Alberta population falls.

(b) Recreation and Culture

Alberta demand for recreational services and longer vacations may increase if the increasing automation of work reduces social interaction in the workplace. Continuing increase in the number of sedentary jobs may encourage more participation in physical activities in leisure time.

By contrast, home entertainment and education based on electronic technology may reduce the demand for formal recreation activities outside the home.

The consequences of environmental change for recreation are uncertain. Outdoor recreation could benefit from higher temperatures. Conversely, demand could be curtailed by lowering of the quality of the province's fishing resource and by the higher risk of skin cancer associated with ozone layer depletion. Renewed interest in the environment may increase the popularity of quality outdoor experiences.

The aging of the population will increase the demand for seniors-oriented programs and sporting activities. The deinstitutionalization of the disabled may lead to demands for the handicapped to be integrated into regular recreation programs.

The sports, recreational and fitness needs of particular ethno-cultural groups may have to be met as Canadian society becomes increasingly multicultural in composition.

Integrated shopping and leisure facilities may become more widespread.

Public demand for cultural activities, experiences and services is growing. Many Albertans are becoming involved in the administration of these activities on a voluntary basis. The provincial government has developed a network of museums, interpretive centres and historic sites.

The demand for cultural services may continue to rise if interest groups grow in strength and principles of participatory democracy are implemented. Moreover, the set of cultural services demanded may change as the population ages, the immigrant population grows and the province urbanizes.

Rising educational attainment may raise the level of cultural participation. Cultural activities previously available in just a few localities may become more accessible through the evolution of telecommunications technology.

By contrast, the vitality of the province's cultural life could be reduced by greater female participation in the labour force, growth in the necessity for some Albertans to take two jobs, and restrictions imposed on disposable income by unemployment or underemployment in younger age-groups.

PHYSICAL AND FUNCTIONAL TRENDS

THE ENVIRONMENT

There are strong indications that the global climate is warming, to the extent that the annual average global temperature will have risen by 4° C between the late 19th century and the late 21st century. The greenhouse effect resulting from the increased production of carbon dioxide and other gases may be a important contributory factor. Areas of the earth's surface will be affected differently, but desertification, melting of the polar ice caps and more frequent drought will be some of the more spectacular results.

In Canada, the western agricultural area could expand northwards (subject to soil limitations) but the southern margins of the country could become more arid. The prairies might experience higher wind erosion, shortages of irrigation water and a greater frequency of drought.

Public concern over the effects of acid rain is increasing. Terrestrial and aquatic flora and fauna are at risk from sulphur emissions which react with water in the air on the ground. Moreover, acid rain precipitation often occurs in a different jurisdiction to the source of sulphur emissions. Alberta is relatively free from acid rain but areas downwind from tar sands plants could be affected.

Concern is also increasing over the disposal of hazardous waste products of manufacturing processes. Non-degradable products are often simply stored or dumped, creating potential pollution hazards.

The ozone layer, which reduces incoming ultra-violet radiation from the sun, appears to be thinning. The propellant compound in aerosols is thought to be responsible as it can cause a chemical reaction in which ozone molecules are broken up. Health problems and climatic warming may result.

Developed countries are increasingly instituting measures to reduce lead emissions by motor vehicles. In North America, the trend towards increased use of unleaded gasoline is continuing.

The world's forest cover is being reduced by the cutting of trees without adequate allowance for regeneration and by the conversion of forested land to agriculture. The rate of deforestation appears to be increasing, particularly in tropical countries. In Alberta, however, regeneration by forest companies is mandatory.

There is growing advocacy for sustainable development: economic development to meet the needs of current and future generations without a loss of environmental quality. Governments and the public are becoming increasingly concerned about the state of the environment.

Other important environmental trends include the depletion of non-renewable resources, the loss of wetlands to agriculture, the increasing adoption of recycling programs, the lowering of regional water tables and the reduction of genetic diversity in plants and animals through man's activities.

MAJOR MUNICIPAL RESPONSIBILITIES

Complexity

Municipal government is becoming more complex due to the development of a global economy, the nature of technological innovation and the ways in which citizens' attitudes are changing. Municipalities are dealing with an increasing number of issues and, with technological change, the sophistication of the information and skills required in decision-making is growing. The provision of opportunities for the public to become involved in decision-making has improved the quality of decisions but heightened the complexity. The broader impacts of decisions made at the municipal level are becoming better appreciated.

Interdependence

Municipalities are becoming increasingly interdependent. Joint efforts among municipalities are becoming more and more prevalent, as exemplified by regional landfill operations and fire protection agreements. The increasing sophistication of municipal operations will accentuate this trend as small municipalities individually may lack the resources to hire experienced staff to service and operate technologically advanced plant (e.g. water treatment facilities).

Partnership between different levels of government in the delivery of services also seems to be increasing. However, a continuing trend for more and more people to live in one municipality but work, shop or seek recreation in another is affecting some municipalities negatively: taxpayers have to pay for services heavily used by non-residents.

The costs of municipal operations are rising. The expectations of residents call for the provision of more and better services. Existing infrastructure (e.g., roads, sewers and buildings) is deteriorating and has to be replaced. The aging of the population structure may create a demand for municipalities to provide amenities such as care services, drop-in centres and seniors-oriented recreational facilities. Due to the difficulty of automating many soft services, municipalities may overcome the rising costs of such services by relying more on volunteer groups.

Realizing a need for greater economic efficiency, various municipalities have discussed or implemented such measures as the contracting-out of services, the inter-municipal delivery of services and the charging of services on a "user pay" basis.

Municipal Financial Trends

In recent years, annual increases in municipal taxes have become a fact of life in many municipalities. Operating expenditures have been increasing among many urban municipalities, counties and municipal districts. However, the total capital revenue and expenditure has been decreasing, suggesting that municipalities have achieved the level of capitalization desired in the present economic situation.

SERVICES

Hard Services

At the Alberta municipal level, hard service systems are aging and deteriorating. This requires replacement when the deterioration is such that maintenance becomes the more expensive option. Public concern over the quality of drinking water will continue to increase, largely because the ability to detect compounds will outstrip progress in explaining the effects of the compounds.

Organizationally, the trend toward regional water systems will continue. Proper water pricing and metering will receive increasing emphasis.

The public will also demand pollution-free rivers and lakes, leading to more innovative solutions (e.g., irrigation of wastewaters) to wastewater disposal in some areas. The siting of lagoons and landfill sites may be opposed by the public because of "Not in My Back Yard" attitudes. The trend towards regionalization of landfills will continue. Recycling programs are increasingly popular as the need to reduce the volume of material conveyed to landfills becomes more urgent.

Transportation

As Alberta becomes increasingly urbanized, the number of trips within urban communities will increase, with implications for municipal public works expenditures. In more remote areas, the development of resources will necessitate construction or upgrading of access roads from the existing highway network.

Technological advances will add strength to pavement. The design of cars, trucks, trains and planes will undergo continuous modification, resulting in greater fuel economy, improved safety and--in the case of trucks--less damage to pavement. Limited budgets may play an increasing role in determining the type of provincial roadway system the province can provide in maintaining our already high standards; rehabilitating the existing system; and expanding to support new growth.

Housing

The volume of new housing production in the future will likely be constrained by growth rates. The annual growth in number of new households is not expected to match the increments recorded in the 1976-86 period. Households headed by persons in older age groups will increase in proportion to the total number of households.

Decreasing family size, the growing number of non-family households and the aging of the population may increase the demand for smaller houses.

POLITICS AND GOVERNMENT

New ideas on the nature of governance (the manner of governing) developed in the United States may become more influential in Canada. There may be increasing support -- and provision of opportunities -- for participatory democracy: public participation in government on a continuing basis. Public hearings are already automatically included in various governmental decision-making processes but public participation could be taken further. Instantaneous communications and high levels of education allow constituents to be as well informed as their representatives, weakening the historical basis for representative government.

The public is becoming increasingly interested in anticipatory democracy: a direct involvement in direction-setting for society. The increasing complexity of modern life and the multiplication of goals in an ever more heterogeneous society call for a vision or integrated set of goals to guide the formulation of solutions to social problems. The alternative is continuing crisis-management. Futures programs can meet the public demand for participation in policy formulation while producing a long-range consensus as to where a society wants to go.

In Alberta, a trend towards public participation and the emergence of interest groups seeking greater involvement in the political process is thought likely to continue. Political activity by citizens' groups, women and native and minority ethnic groups may be expected to grow. Substantial structural changes in the way municipal policy is formulated are not foreseen.

TRENDS AND TECHNOLOGY

THE NATURE OF TRENDS

A. Definition

Definition

Trends provide guidance about the way changes are taking place over time. A trend can be described in terms of a time frame and changes in quantity. In the long run the patterns of change are more important than the details; it is these patterns that are referred to as trends.

Interrelatedness

Individual trends cannot be studied in isolation; the various parts of the world are interwoven together. A very broad appreciation of changes in all areas of life is needed to begin to determine what is important and what is not, what must be studied and what can be ignored.

How to identify

Wherever possible it is important to determine at least three things about a trend; the rate of change, the reasons for change and interrelatedness with other observed trends.

Not all changes occur at the same pace. Some things change so slowly that, for most purposes, they do not change at all, e.g. the shape of Alberta's land mass. Most things change more rapidly than mountains but still slowly enough that careful observation is required to see them change, e.g. the basic ethnic mix of Alberta's population or the way fields are farmed, or the role of women in society.

Causes of Change

Change will be easier to accept if the reasons for change are understood. An understanding of the reasons for change permits better forecasting of implications and impacts. It is particularly important to distinguish between changes that occur as a result of human activity and changes resulting from other causes.

When several trends are brought together it is often apparent that there are larger implications than the individual trend itself. It is important to identify the effect of interaction and the cross-impacts among trends, in order to develop a full understanding of the broad picture.

B. 'Broad' or 'Mega' Trends

These broad trends are sometimes referred to as mega-trends. Some futurists go further and call those trends that are so fundamental that they underlie and appear in all areas of life, meta-trends. Some meta-trends are as follows:

1. The meta-trend towards publicly acknowledging the reality of change.

Reality of Change

The fact that our world is a dynamic and changing place means that things cannot be 'fixed' once and for all. In matters of public policy, there are no answers or solutions that are "final and forever". Things change. As they do, it is necessary to adjust and adapt. What is needed then, are not perfect solutions, but solutions that work currently and keep options open.

2. The meta-trend towards integration, towards recognizing the interrelatedness of things.

Integration

The normal process of analysis has been, and still is, to deal with things one at a time, as if each thing is separate from all the others. There is a tendency to separate economic development from social matters and both these from the arts. Work is separated from play, roads from welfare, thinking from doing, learning from working, planning from production and both these from marketing. This sense of the separateness of things can be seen virtually everywhere. But it is being eroded by the increasing recognition that things and their relationships now have to be dealt with together, and not just with one thing at a time all by itself.

3. The meta-trends to good information and knowledge being increasingly widespread and more easily available in society.

Integration

Society is subject to much more scrutiny than used to be the case; and society is becoming more transparent. One result is an increasing demand for accountability at all levels of the society. A further outcome is that the differences between cities and rural areas are diminishing. Good current information in large quantities used to be available only in cities. Now rural areas can have access to almost as much information as city people can. This suggests that, in the very long-term, there may be a trend to re-populate the countryside.

4. The meta-trends towards greater complexity.

Complexity

This meta-trend is well recognized from living daily life in that society today is more dynamic, inter-related, more confusing and complex than the society into which most of us were born. But many current practices are based on the assumption that things can be dealt with one at a time in a simple way. This mismatch adds to stress.

Another source of increased complexity is unfamiliarity with the meta-trends noted here; they are still new to us; they have not yet become normal and taken for granted.

5. The meta-trend towards the increasing recognition that ours is a time of very fundamental change; that we are between two worlds.

Fundamental Change

Thirty years ago we seldom talked of change. Even when change was recognized, small discrete changes were assumed that would not disturb the future as an industrial society. This may not longer be true. In fact, an increasing number of people are coming to the view that all the major trends and the meta-trends add up to a slow but very fundamental long-term transformation of society.

Society today may be in the midst of becoming something different from the past but the shift is still in progress. There is increasing agreement that, slowly, society is becoming less and less industrial, but, as yet, there is no consensus about what will emerge.

Some talk of a "post-industrial" society, others of a "communications" era, still others of an "information economy". The title matters little. What does matter is the fact that we are becoming aware that the current climate of change is likely to add up to much more than just more changes within our present industrial society.

TECHNOLOGY BEYOND 2000

A. Definition

Nature of Technical Change

Technology may be defined as the application of technical change and organized knowledge to the development of a new product, process or system for practical and productive use. Technology in many respects is the engine that drives our social and economic system. Yet, history has taught that technological development and assimilation is not a smooth continuous process. Technical change tends to be uneven over time, occurring in pulses or waves. Clusters of technical innovations of wide adaptability can be the catalyst for periods of sustained, strong economic growth. Both the rapidity of change and pervasive nature of many of the recent technologies indicates that the next twenty years could lead to unparalleled change and economic development.

A few technologies are selectively described below that are expected to have far-ranging implications. In this context biotechnology, advanced materials, microelectronics, telecommunications, and electrotechnologies will impact everyone in Alberta to varying degrees, whether we reside in urban or rural areas.

B. Advanced Materials

Evolution of Materials

Conventional materials are being threatened by substitution of a new array of complex and exotic materials such as polymers (plastics), composites, advanced ceramics and metallic superalloys. These are the materials which will dominate the twenty–first century giving birth to new industries, new fabrication processes and new technologies.

The history of the human race has been closely intertwined with the evolution of materials; witness the terms Stone Age, Bronze Age, Iron Age and, now the Space Age Materials. Pure economics will no longer dictate materials choice. The relationship between price and performance will emerge as the governing issue.

Space Age Materials

This trend means that the wave of the future may be the new space age materials, as well as innovative creations of conventional materials (new alloys and novel processing techniques). Today, these advanced materials comprise only 5 percent of the total materials market; this could reach 25 percent around the turn of the century.

Plastics

The polymers or plastics industry is probably now entering a period of explosive growth as the products of intensive research and development over the past two decades finally emerge. Plastics are, in fact, diverse, complex chemicals. Today, there are about 40 different plastics families and well in excess of 10,000 different plastics. Many of the basic plastic resins are already familiar, for example, polypropylene, polystyrene, polyethylene, polyester, nylon, acrylic and polyvinyl chloride (PVC). The challenge for the plastics industry will be the transition from the relatively functional materials, such as fibres, films and coatings — to the high technology

complex materials of the future, incorporating high strength, high temperature resistance, high mechanical stress and solvent resistance.

Beyond the turn of the century, plastics are likely to be the all-pervasive material. Not only will the trim and interior of transportation vehicles be plastic, but plastic body panels will be commonplace. The new plastics will have high strength, high temperature resistance for furnace drying of paint, as well as advantages of faster assembly and fewer body parts in computer-assisted manufacturing and automobile plants. The packaging industry could be revolutionized as plastics replace glass, steel cans and aluminum. Plastics' properties of resistance to breakage, light weight, aesthetics and microwavability will be strong advantages.

Formability and aesthetics will lead to increasing applications in a myriad of consumer products. Even the construction industry may not be immune to the plastics onslaught, for sheathing materials and even load-bearing structures.

Non-Degradability

The only formidable obstacle to increasing use of plastics is the environmental concern of non-degradability. These concerns should be alleviated through a combination of new biodegradable plastics as well as an intensive program of recycling. A major new recycling industry could be born. Plastics would need to be labelled for ease of consumer sorting, then collected, graded and stored as recyclable streams of different plastics. This differs only in degree from the operations of present-day metal scrap yards.

Composites

For more exacting performance, at higher costs, composites will emerge as the materials of choice. Composites, as the name implies, are a combination of materials consisting of fibres or particles embedded in a matrix or binding agent. Composites possess combined properties not possessed by single materials alone. Their use will increase where high performance tends to outweigh cost considerations. The aircraft industry (fuselages), the automobile industry (bumpers) and high quality consumer products (sports equipment, high quality appliances and furnishings) will be prime targets.

Ceramics

Advanced ceramics are also expected to emerge as a major growth industry in the mid–1990s and beyond. Ceramics fall into two distinctive categories based upon the exploitation of different properties; the functional and structural ceramics. Functional ceramics exploit optical, electrical or magnetic properties. This is already a fairly mature industry, but substantial opportunities still exist in new sensors, optical applications and protective layer devices against lightning strikes. Structural ceramics, however, capitalize upon the physical properties of light weight, high temperature and high wear resistance. As such, major ceramic industries could evolve to produce cutting and grinding tools, automobile components, and uses in a range of wear–resistant consumer products such as knives and scissors. The ultimate achievement could be an all–ceramic engine in automobiles. Ceramic engines operate at high temperatures of 2600°C, permitting fuel efficiency gains and multi–fuel flexibility in the same engine. Ceramic composites may be the ultimate material of choice for such engines.

C. Biotechnology

Biotechnology is really the fusion of many scientific disciplines including biology, physics, chemistry, engineering and computer science. Biotechnology, per se, is not new, but what is new is its evolution to a stage where we can actually adjust genetic material. This ultimately has profound technological (and ethical) implications, giving us some element of control over life itself.

Commercial Products from Biotechnology

Biotechnology has been, in the eyes of many observers, the "sleeper industry" of the 1980s. Behind the scenes, however, the industry has been building a foundation through intensive research and development. Commercial products are now beginning to emerge such as human insulin, a natural growth hormone to treat dwarfism and a revolutionary new drug, Actinase, which can actually arrest heart attacks in progress. More dramatic results await us in the 1990s and beyond, which will literally impact on every facet of human activity.

Biotechnology developments occur in three primary areas — the human health field, animal biotechnology and plant biotechnology. To date, commercialization of agricultural biotechnology has tended to lag behind developments in the human medical area. The wide ranging implications of biotechnology on agriculture are now well recognized and research activities are being intensified.

Medical

In the human medical field, some dramatic progress in the application of biotechnology is expected in the 1990s and beyond. Breakthroughs could occur in the understanding of the workings of the immune

defence system, the development of artificial internal organs, major advances in genetically–engineered pharmaceuticals and the unravelling of the complex structure of many of the human genes. For the early twenty first century we may be well on the way to unravelling the whole set of human genes called the genome. This would give us the ability not only to predict hereditary disease patterns, but also to assist in the correction or treatment of gene defects.

Agriculture

Biotechnology applications in agriculture could have significant impacts on Alberta's agricultural industry over the next 20 years. Developments in animal biotechnology are expected to evolve rapidly in the 1990s.

Livestock

Embryo transfer may lead to radical improvements in the quality of livestock herds. Results could be evident in higher milk yields in dairy cattle and more efficient conversion of plant feedstuffs to animal protein in livestock reared for meat. Embryo transfer in cattle is commercially practised today, but will expand rapidly. Such techniques will probably also be developed for swine and sheep, leading to greatly improved genetic characteristics. International trade in frozen embryos will become big business.

Biotechnology will also lead to marked progress in disease prevention and control, through genetically–engineered vaccines. These vaccines will be more efficacious, safer, cost effective and more specific. Natural growth hormones (proteins) will dramatically impact livestock herds. In dairy cattle, these growth hormones will give superior feed efficiency and much higher milk yields. In livestock herds, large increases in feed efficiency will

occur, faster growth rates and enhanced meat quality — leaner meat with less fat and cholesterol. This will have implications on size of herds, optimal size of farms and markets.

Plants

Plant biotechnology has received less attention than animal biotechnology. Commercialization of genetically improved plants is probable, therefore to materialize later. By the late 1990s, however the fruits of today's research labours should be apparent and should be entrenched during the early 21st century. Developments could include more prolific yielding plant strains and plants genetically endowed with resistance to selective pesticides, pests, drought and frost. The ability of legumes (peas and beans) to extract nitrogen from the air to serve as a fertilizer could be extended to many of the cereal crops. This could substantially reduce demands for synthetic nitrogenous fertilizer.

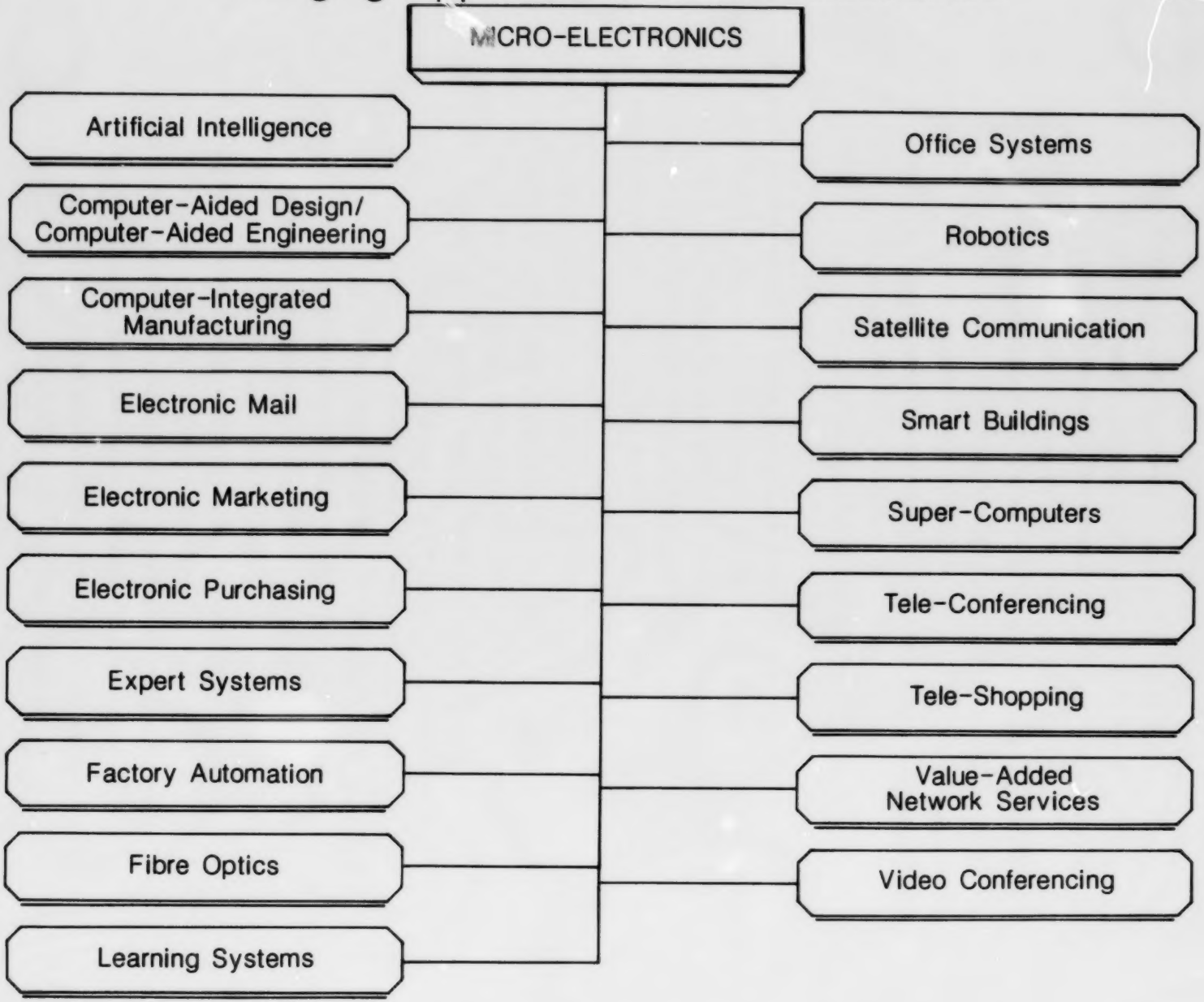
The prodigious oil content of the rapeseed has been long known, but the oil is toxic to humans. Genetic manipulation in Canada, however, has successfully developed a new strain, canola, which retains the prolific oil production characteristics of rapeseed, but can now produce an edible product. In future, flaxseed may also emerge as an important crop for edible oil production in Alberta.

D. Microelectronics/Telecommunications

The 1980s have given us but a little foretaste of what is to come in the field of microelectronics and telecommunications (Figure 1). Offices are already being revolutionized by computers, factories by robotics and homes by a whole array of new electronic devices

FIGURE 1

Emerging Applications of Microelectronics



(compact disc players, microwaves, VCRs and the newly emerging digital audio tape machines). Developments yet to come, however, are expected to be breathtaking in scope and speed of adoption. Profound social and economic ramifications will result.

Supercomputers

The trend to miniaturization of computers is expected to continue unabated, as the microchip becomes much smaller. Microcomputers around the turn of the century will probably be the size of today's hand-held calculators. Supercomputers up to a thousand times more powerful than today's will lead to significant gains in artificial intelligence, expert systems, more accurate weather forecasting and better three-dimensional interpretation of seismic data for minerals exploration.

Robotics

Robotics will proliferate throughout the resource and manufacturing sectors. Their use will be focussed, however, and they are expected to become the 'industrial insecticide', eliminating mainly the dirty, dangerous and tedious occupations. The first truly integrated manufacturing facilities in the world of computer-integrated manufacturing are expected to emerge in the 1990s.

This will lead to a fusion of all corporate functions of design, purchasing, manufacturing and marketing into a fully integrated microelectronic-telecommunication network. Even the service sectors will not be immune to the robotic invasion, for example in areas such as mail distribution, medical operations, cleaning and even some construction site tasks. Robotics in the service sector, however, will be much slower to develop than in the resources and manufacturing sectors.

Technological Integration

Beginning in the 1990s some of the most significant changes will occur in the integration of technologies. We are now witnessing the merging of microelectronics and telecommunications. Fibre–optics is the catalyst to this development and its installation is mushrooming. The result is the development of vast country–wide (and indeed global) communication networks or information conduits. Electronic Data Interchange (EDI) and the Integrated Services Digital Network (ISDN) will permit simultaneous transmission of data, voice and image. A new world is unfolding of electronic mail, teleconferencing, teleshopping and electronic purchasing. Managing this approaching era of information overload will be the real challenge of the 1990s and beyond.

Telecommunications

Telecommunications could bring radically different social organizations and interactions. It may open up avenues for the rejuvenation of shrinking rural communities, through telecommuting. Will these technologies lead to an arrest or reversal of urbanization trends of the past several decades? A word of caution must be injected, best captured in what John Naisbitt has called 'high–tech and high touch'. By this Naisbitt means that the full potential of technologies will not be realized, without full consideration being given to the human element. Telecommuting may fulfil a requisite service for specific individuals, professions and minorities (the handicapped). The gregarious social instincts of many people, however, and the "need" for the communal office or factory may place severe constraints on mass telecommuting.

What Gene Bylinsky has called the Age of Insight could also revolutionize medical diagnosis and treatment over the next several decades. The enormous processing capability of computers, combined with the

genetic manipulation of biotechnology offers high hopes for rapid medical advances beyond the turn of the century. New body scanning techniques and increasingly sophisticated microelectronics could lead to early diagnosis of the major killer diseases such as cancer, heart disease and strokes.

E. Electrotechnologies

Canada and Electrotechnology

The structure of Canada's future economy and the role of electrotechnologies are intimately entwined. Industrial restructuring, value added production and the entrenchment of the information or knowledge-based economy drives us irreversibly to a more electric-intensive future. Globalization demands increasing competitiveness and high productivity — electricity is the energy form best suited to meet these requirements.

Electrotechnologies

The information economy of the future is reflected in the pervasive nature of the new technologies of microelectronics, robotics, computer-assisted manufacturing, lasers and telecommunications. All are driven by electricity. Laser technology will be used in telecommunications, as well as increasingly sophisticated cutting, drilling, heat treatment and welding processes. Their use will greatly expand in the health field. Microwave technology is expected to expand beyond the kitchen into larger industrial applications. Microwaves will find wider acceptance for industrial drying application in such diverse sectors as food, rubber, chemicals, grain, textiles and the paper industry.

Thermo-mechanical

Electric intensive thermo-mechanical pulping may emerge as the preferred pulp-making process, due to high wood yields, lower capital costs and low environmental impacts. This technology could play an important role

in Alberta permitting increasing use of our more rapidly growing hardwood (poplar/aspen) resources. Plasma arc torches, which convert electrical energy into heat energy at high conversion efficiency, offer good future prospects in diverse sectors. The high temperature (up to 10,000°C) will permit more efficient metal smelting, wastes materials recovery, hazardous waste destruction, powder metallurgy and advanced ceramics manufacture.

Superconductivity

Superconductivity has been the high profile electrotechnology of the late–1980s. While acknowledging that a significant scientific breakthrough has occurred, the media–hype of a new technology revolution may be grossly exaggerated. The discovery of superconducting materials at a temperature of inexpensive liquid nitrogen, rather than the lower temperatures of very expensive liquid helium, is significant. The road from scientific discovery to commercial realization, however, will likely be a long one.

Short–term applications will probably be limited to small–scale uses such as medical scanners. In the 1990s the new superconductors may also be used in microelectronic circuits and memory elements.

Breakthroughs of superconductors in large–scale applications such as electric power transmission and storage, magnetically–levitated trains and superconducting magnets in cars are still quite distant. The only one likely to see any substantive development in the next 30 years is possibly the use of superconductors in new electrical transmission projects.

Hydrogen Society

The ultimate role of electricity in 30 years could be as the harbinger of a Hydrogen Society, through advanced systems of water electrolysis. In many respects hydrogen is the ultimate, clean, renewable resource. The Report of the Advisory Group on Hydrogen Opportunities in June 1987 in a publication entitled Hydrogen summarized it thus:

"In the long term, energy transactions will be dominated by the currencies of hydrogen and electricity. It is more difficult to name the energy sources which will be used to manufacture these currencies. But much more than the unpredictable sources, the predictable currencies electricity and hydrogen will shape the world's future."

The concept of the Hydrogen Society could become strongly entrenched, if dire predictions by many scientists of the "Greenhouse Effect" are substantiated. Hydrogen fuel is the ultimate non-pollutant, releasing only water vapour after combustion.

F. Implications

Knowledge Intensive Industries

The dawning of the Information Age will bring in its wave of new, knowledge intensive industries. Some of the most pervasive and significant technologies have been reviewed in this section. Profound social and economic implications flow from their development.

Many of the basic goods producing sectors from agriculture and energy to manufacturing will become increasingly automated. More output will be generated with less people, as automated forms of production (robotics, computer-integrated manufacturing, etc.) take hold. Expanding services, information and high value-added (knowledge-intensive) production, on the other hand, will require more workers. The growing mismatch of competencies, however, is likely to present formidable challenges and demands in the field of adult re-education. Frequent occupation changes and life-long learning principles will become entrenched in the new Information Economy Centres of excellence which may be created in the emerging technologies.

Many of the new technologies discussed are already being developed in Alberta. Building on this foundation will ensure diversification of our economy in a direction less dependent on agricultural and energy resources. Yet many of the new technologies also complement and indeed enhance the overall competitiveness of our resource mainstays. Biotechnology is expected to broaden our agricultural base into more diverse products and downstream food processing. Microelectronics and telecommunications are expected to impact all facets of our economy.

Telecommunications

Telecommunications offers, at least, the potential to affect the trends to population decline in some rural municipalities, especially those strategically located with respect to major urban centres.

Telecommunications are expected to make physical proximity less important. Telecommuting has the potential to create a harmonious blend of country living with city work.

An aging population and increasing longevity from biotechnology breakthroughs has obvious implications for the health–care system. The trend to highly sophisticated diagnostic equipment and medical expertise favours increasing centralization of hospital services. Biotechnology is expected to create grave ethical and ecological concerns in the twenty–first century.

Finally, increasing concerns over the "greenhouse effect" will favour increasingly the use of less polluting natural gas and non–fossil–fuel generated electricity at the expense of coal and oil products. Towards the end of the period the seeds of the post–hydrocarbon, or hydrogen society, may be taking root.

PEOPLE AND VALUES

World Population

A. Global and Canadian Trends

There is widespread agreement that the world's population will continue to grow for the foreseeable future, largely due to the raising of life expectancy of virtually all age groups. The main trends are well known. Population is growing rapidly in lesser developed countries as death rates fall but birth rates remain high. In developed countries, population is levelling off because falling death rates have been accompanied by falling birth rates. The likely outcome will be a very youthful Third World population and a growing proportion of elderly citizens in the more developed countries.

Canadian Population

In Canada, population will continue to grow in the short term. However, the trend is towards a gradual lowering of the growth rate over the next fifty years until the population stabilizes between a low projection of 26 million and a high projection of 33 million during the first two decades of the twenty-first century. Canada could then enter a period of population decline, which is also expected in some Western European countries.

Age Composition

Statistics Canada indicates that, if low fertility rates prevail, there may be an absolute decrease of persons aged 0 to 17 years. Persons 18 to 64 years of age will increase in both absolute and relative terms until the second decade of the 21st century, but will decrease thereafter if the nation experiences only low or medium growth. The over-65 age group will grow steadily so that, by the year 2016, it is possible that as many as 18 percent of Canadian citizens will be senior citizens.

Population Growth

In Alberta, the average rate of population growth in the next thirty years is expected to be significantly lower than the past thirty years. In 1956, the population of Alberta was 1.12 million. Over the following three decades the population more than doubled to 2.38 million. The next thirty years may show population growth to between 2.92 and 3.69 million (Figure 2), according to the Alberta Bureau of Statistics.

Recent Trends

Since the 1950s, Alberta's population growth has fluctuated from less than 1 per cent in the mid sixties to a record 4.5 percent in 1981. During the 1970s, the average annual rate of growth was more than 4 percent. During the boom years population growth was nothing short of spectacular, adding population figures similar in size to the City of Lethbridge on an annual basis. Between 1976 and 1981, the population of Alberta grew by 21.7 percent. This contrasts with 6.1 percent growth between 1981 and 1986, which was still the highest rate of growth in Canada. Over the next thirty years population growth is expected to average between 0.7 percent and 1.6 percent annually, depending on the projection chosen.

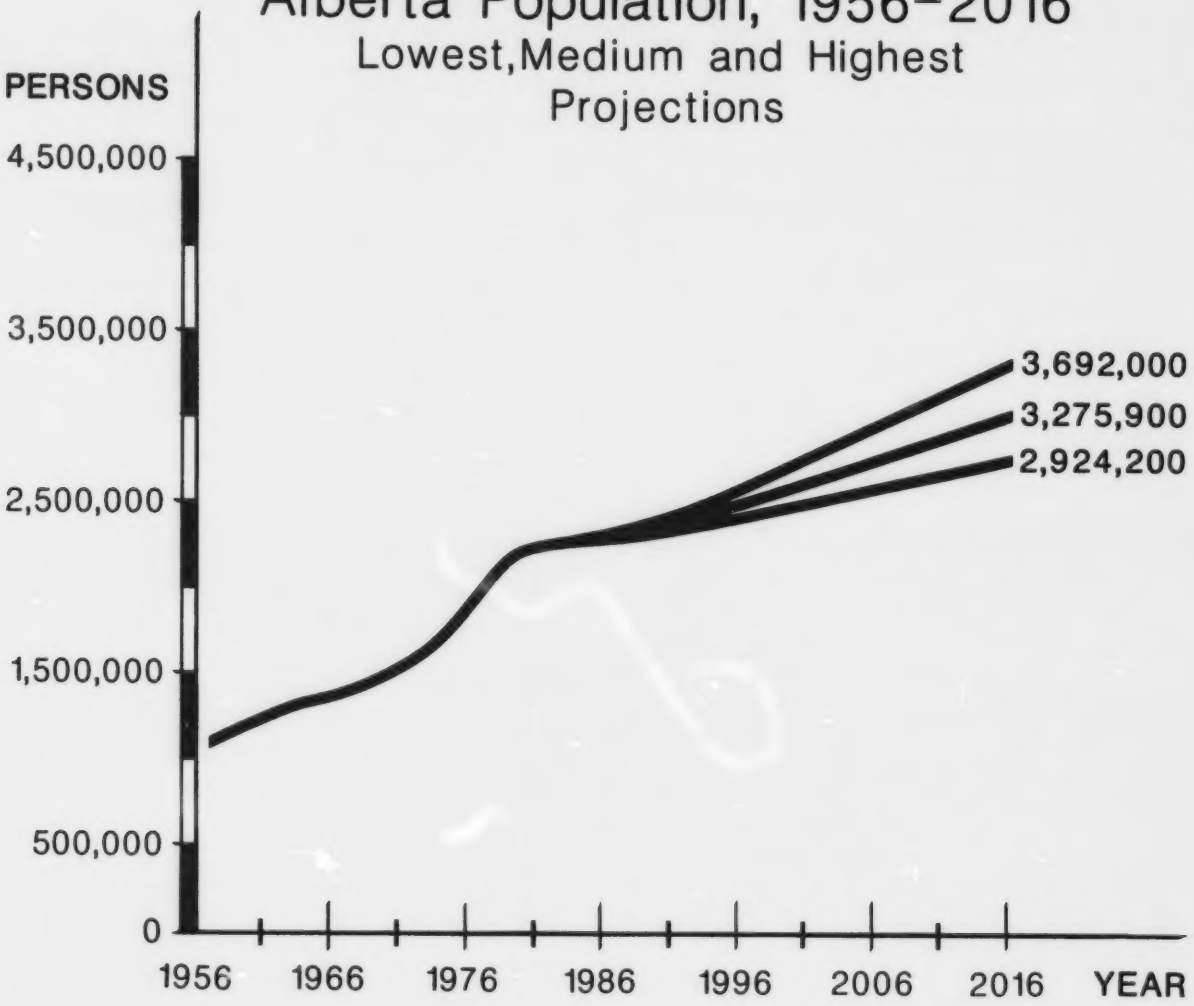
Impact of National Trends

All areas of the province are expected to be affected by two dramatic national trends in population characteristics; the decline in fertility rates since the 1960s and the progressive aging of the population. As the baby boom generation moves beyond its peak child-bearing years, the age-specific fertility rate is projected to increase marginally from its present low level or continue to decrease. The rate is currently either at or just slightly below that needed to maintain the population at its present size in the absence of immigration.

FIGURE 2

Alberta Population, 1956-2016

Lowest, Medium and Highest Projections



SOURCE:
Alberta Bureau of Statistics.
Population Projections Alberta 1987-2016.

Baby Boom Echo

The temporary resurgence in the provincial birth rate (baby boom "echo"), resulting from the postwar baby boom generation having their own children, does not reflect a rise in fertility rate. The birth rate peaked in 1983 and the echo will become indistinct in the 1990s when two–thirds of Alberta adults will be passing through their child–bearing years. Nevertheless, the effects will be felt for some years to come, as the children of the 1970s, 1980s and 1990s move through the educational system and out into the work place.

Migration

In the face of low levels of natural increase, the growth of the Alberta population will be largely determined by the magnitude and character of migration movements. Historically, Alberta has been a net recipient of both interprovincial and — to a lesser extent — direct international migration. However, the volume of migration has fluctuated dramatically.

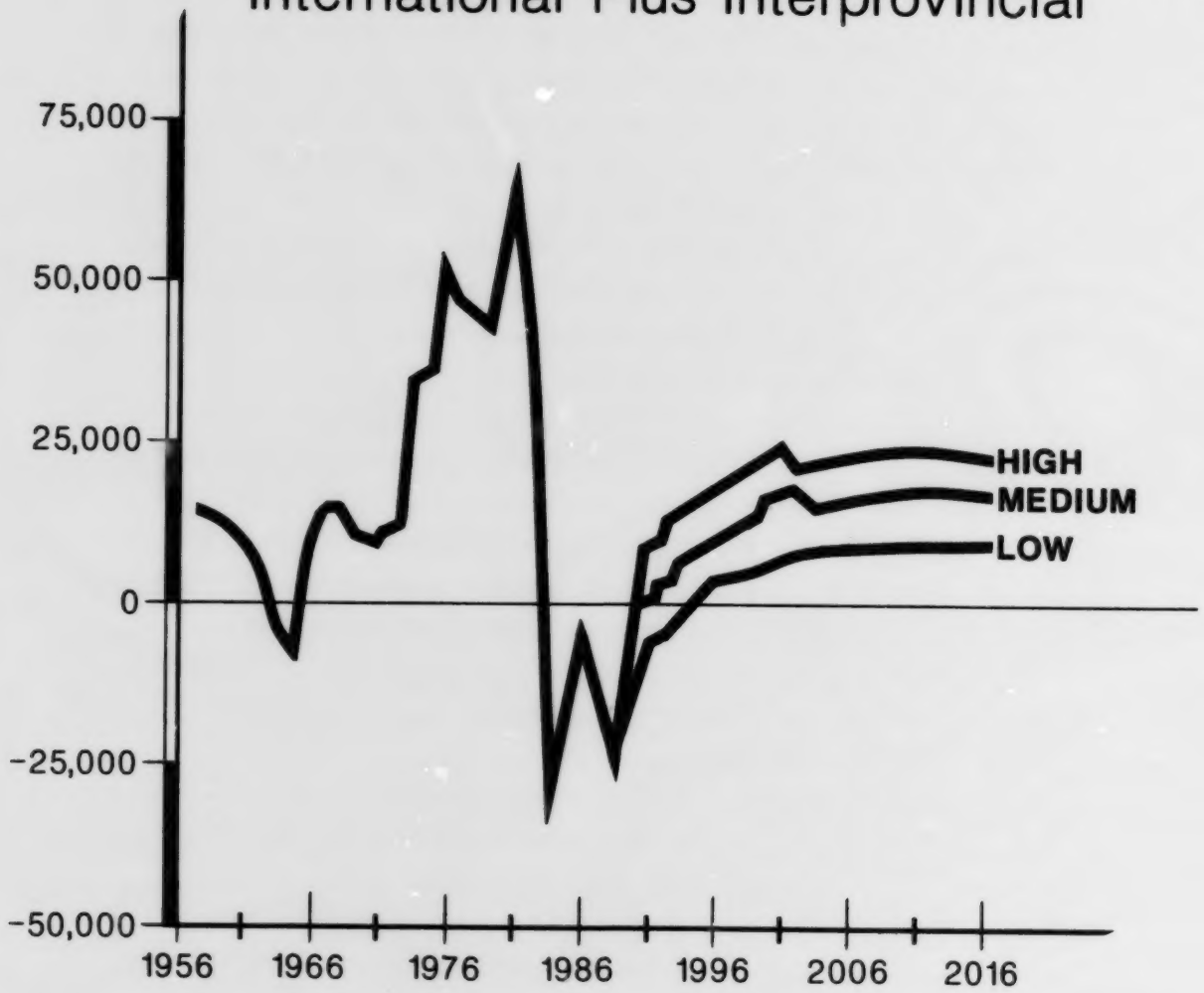
Many interprovincial and international migrants have entered the province during periods of economic expansion but, during the economic downturn of recent years, many of the new interprovincial migrants who arrived in the previous boom returned to their province of origin. By contrast, international migrants tended to remain in the province.

B. Alberta Trends

On balance, Alberta experienced net migration losses during the depths of the recent recession, but the expectation for the next thirty years is net migration gains, which may occur over the next few years before stabilizing around the turn of the century (Figure 3). Interprovincial migration will likely continue to be the most significant component although international migration will grow in importance.

FIGURE 3

Net Migration, 1956-2016
International Plus Interprovincial



SOURCE:
Alberta Bureau of Statistics.
Population Projections Alberta 1987-2016.

Aging

The aging of the population refers, in statistical terms, to the raising of the median age of Albertans and to progressive increases in the proportion of Albertans over 65 years of age. In 1986, the median age of Albertans was 29, that is, one half of the population was younger than 29. By 2016, however, the projected median age is between 36 and 40, depending on the fertility and migration rates assumed. Over the same period, the percentage of Alberta's population over 65 years of age is expected to rise steadily from 8 percent to 16 percent; in the postwar years up to the 1980s, the proportion had remained fixed around 7 percent.

Causes of Aging Population

The principal reasons for the aging phenomenon are the aging of Albertans born in the postwar baby boom, a decreasing fertility rate and the increases in life expectancy associated with advances in medical technology, palliative care and rehabilitation programs. Life expectancy is projected to rise from 73.3 years to 78.5 years for males and from 80.3 to 83.7 years for females.

The corollary of an increasing proportion of seniors is the decreasing proportion of people in some other age groups. Most notably, the proportion of those younger than age 45 may drop from 75 percent of the population in 1986 to only 58 percent in 2016 (using mid-range estimates). Children, aged 0–14, may account for only 17 percent of the population in 2016, compared to the current 24 percent, although numbers will be generally stable with 568,000 children in 1987 and 569,000 in 2016. The number of seniors, however, will more than double, from 201,000 to 472,000. The working age population (15 to 64) will continue to grow at the same rate as the total population, thus continuing to account for about 68 percent of the total population.

Consequently, the working age population will be facing a growing cost of health, social and pension programs serving the elderly. Not only will there be a larger clientele but the per capita annual health care costs for a 70 year old in Canada are four times the costs for a thirty year old and eight times those of a ten year old, being exceeded only by the costs incurred for a child in the first year of life. Over the age of 70, the cost curve rises steeply.

Implications of Aging Population

Some of the implications of the aging population structure can be grasped by expressing the number of children and elderly relative to the working age population in percentage terms (dependency ratios). The combined elderly and child dependency ratio is projected to remain at about 47 percent throughout the period ending 2016.

The combined ratio for Canada as a whole will behave similarly although in the period 2010–25 the ratio will jump from 47 percent to 61 percent. However, the elderly dependency ratio will increase (from 12 percent to 21 percent) while the child dependency ratio will decrease (from 35 percent to 26 percent).

C. Population Distribution in Alberta

Location Shifts in Alberta

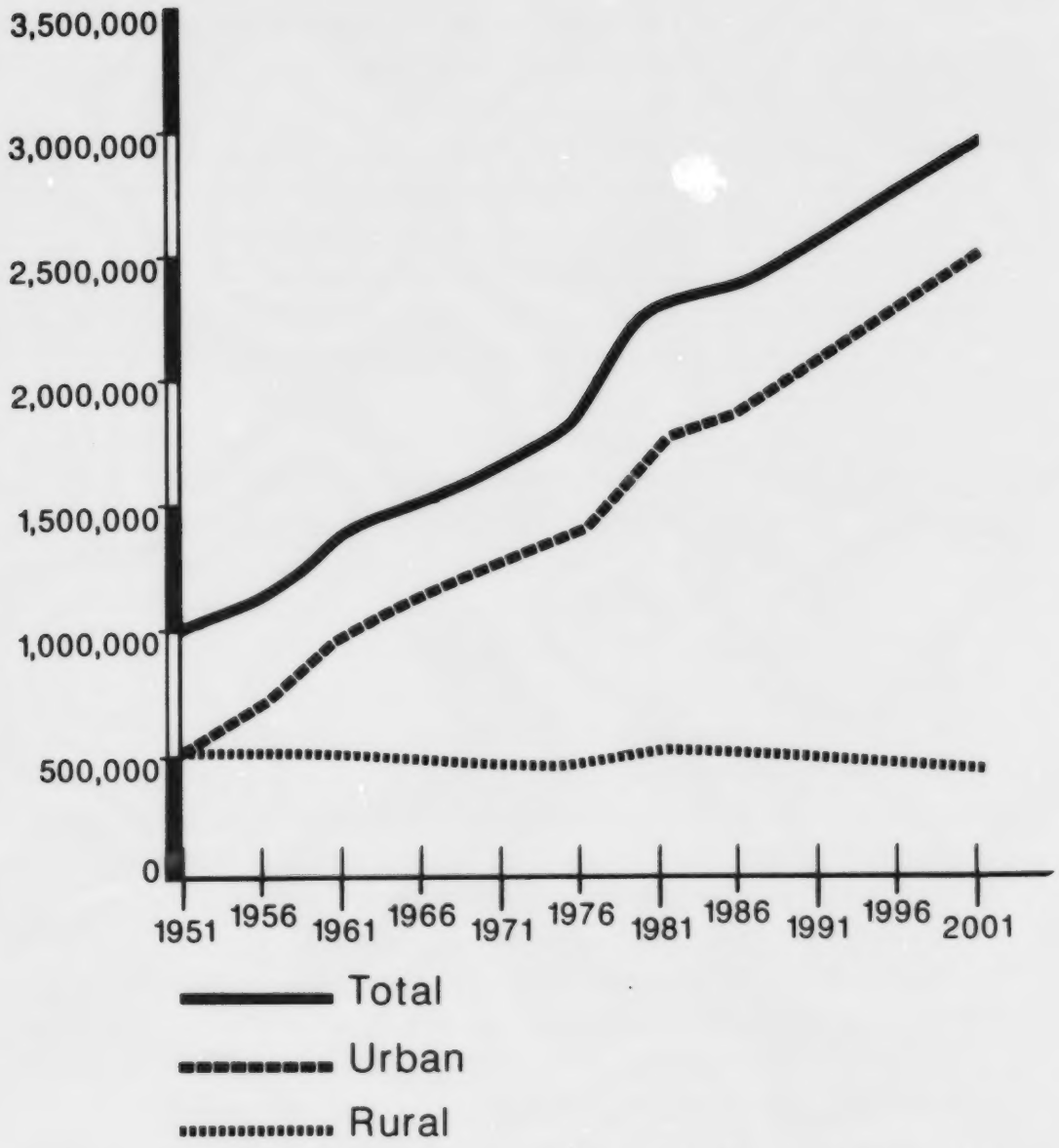
Some shifts in the distribution of urban and rural population have taken place over the past thirty years and additional shifts are anticipated in the next thirty.

Population growth is expected to occur largely in the province's urban centres (Figure 4). The rural population — the population not living in urban communities of over 1,000 people — may continue to become smaller;

FIGURE 4

Alberta Population, 1951–2001

(Low Growth Scenario)



URBAN AREA: An area with a population concentration of 1,000 or more, and a population density of 400 or more per square mile.

RURAL AREA: All territories lying outside urban areas.

SOURCES:
Alberta Bureau of Statistics;
1951,1961,1971,1981, Census of Canada.

the share of the Alberta total slipping from 23 percent in 1981 to less than 14 percent in 2001, a net decrease of over 29,000. Nevertheless, study of past trends shows that there have been large variations in growth between urban and rural municipalities and even among municipalities of similar size.

Urban Distribution

For example, in the post-boom period of the 1980s, fully 40 percent of the province's municipalities have lost population (as indicated by data for 1982 and 1987), although the provincial population as a whole increased. The village was the type of municipality most prone to decline, the number of declining villages exceeding the number of growing villages. In all other categories of municipality, by contrast, the number of growing localities was greater than the number of declining localities, although by varying margins of difference. The provincial trend is thus the result of growth in some places and decline in others.

At present, over 80 percent of Albertans live in urban municipalities — a share that has been gradually increasing for some time. Included among the contributory factors are past influxes of out-of-province migrants and the continuing movement away from the land.

Based on the data for the 1980s, those urban municipalities which are declining have a smaller average population than growing centres and also tend, on average, to have a higher proportion of seniors. Thus, it would appear that younger people are leaving to seek opportunities elsewhere. The aging of the population structure is not likely to be confined to small communities, however.

Future Growth

If current trends continue, future population growth may be concentrated in the larger urban centres, with many of the province's smallest centres and the rural areas continuing to decline.

Rural Distribution

The principal reasons for rural decline would likely be a further reduction in the number of farms and the continuing movement of farm children to large urban places for employment upon graduation from high school. However, rural population loss is by no means a foregone conclusion in all localities. The rural population in some areas may increase due to former urban–dwellers taking up residence in the rural–urban fringe (e.g., in country residential subdivisions and acreages) or beyond.

An influx of newcomers would appear most likely to be experienced by rural areas adjacent to the province's largest urban centres. The major unknown in this context is the future level of oil prices. A steep rise in the price of oil would raise the costs of commuting to a distant urban workplace and weaken the attractions of living outside a continuous built–up area. On the other hand, telecommuting — referred to earlier in the chapter on technological trends — might remove the need for some people to travel daily to an urban workplace. Furthermore, commuting would not be of concern to retired families — who will be increasing in number — so retirees who opt for a rural residence also could contribute to rural population growth. Whatever the specific cause of growth, a growing body of newcomers with urban roots seems likely to change the character — as well as the size — of the "rural" population in a particular area.

It is difficult to speculate on whether these trends to shifting population location will continue because they are dependent on the interaction of a number of economic and social factors.

Major uncertainties are likely to continue to exist, making forecasts very unreliable. It is also clear that individual communities can influence the course of their own population changes through local initiatives in quite a major way. Therefore, no individual municipal forecasts are offered and these should be developed, if required, from specific local knowledge by Municipal Facilitators.

D. The Family

Family Characteristics

As values within society have changed, so also has the concept of the family. The norm at one time was the extended family; that is, children, parents, grandparents, uncles, aunts, cousins, etc., all living within a short distance of one another and all being involved intimately in each other's lives. This form was subsequently replaced by the nuclear family, consisting of father, mother, and an average of 2.5 children per house: an arrangement which has come to represent the idealized image of the family in contemporary society, but which may be subject to change.

In fact, the family type which is represented as the "ideal" or the "norm" at any particular period of time may only be one of several family styles that may exist. The typical Alberta family is still the nuclear family, although the lowering of the birth rate and increases in numbers of childless families, single parent families and single person families has reduced the average size of a family from 3.7 persons in 1971 to 3.2 persons in 1986. A further drop, to 2.48 persons, is forecast to occur by 2006.

These changes in social characteristics may be accompanied by shifts in social service needs and delivery methods. Families depending on the provision of social allowances are typically low income but the size of low income families is gradually increasing. In addition, increased demands for income support is expected from elderly people as their numbers increase, although the average cost per case is decreasing due to improved private pension policies. Handicapped persons are likely to require greater financial assistance due to the increased substitution of independent, supported living arrangements for institutionalization.

Marriage, Divorce and Fertility

Alberta has the highest marriage rate in Canada but it also has the highest rate of divorce (345 per 100,000 in 1985). Statistics Canada suggests that marriage rates will stabilize, or even decline slightly, as fewer divorced people seek to re–enter a second marriage. The divorce rate, on the other hand, still continues to increase, albeit only moderately. As a result of these two trends and continuing decline in fertility rates, the numbers of singles and single parent families will increase. In 1976, 9 percent of all families in Alberta were single parent families but by 1986 the proportion had increased to 12 percent, the highest in the nation, with the vast majority headed by females (82.3 percent).

Female Labour Force Participation

One implication of the change in family structure and of the rising rate of female participation in the labour force is a probable increase in the number of "latchkey" children (children unsupervised by an adult after school). The Special Committee on Child Care established by the House of Commons in November, 1985,

estimated that approximately 15 percent of children aged 6 to 12 years in the prairie provinces fell into this category; so by applying this percentage to the 242,000 six to twelve year–olds in Alberta in 1986, there are estimated to be approximately 37,000 latchkey children in the province.

Daycare

Another implication is that the number of children requiring daycare will increase. Moreover, studies that have examined the policy implications of the demographic changes in family structure have noted that there will be changes in the nature of child care. For example, there will be growing demands for institutional child care, as well as pressure for new work place arrangements such as flex time, job–sharing, flex place and paid time–off when children are sick to allow parents to take more care of their children themselves. Furthermore, if an acute shortage of labour is ever experienced, it is possible that Canada may follow the experience of European countries in passing various laws to encourage wives and mothers to participate in the labour force even more fully — with further ramifications for daycare demand and supply.

E. Education

Post–Secondary

Post–secondary institutions (universities, community colleges and technical institutions) are presently located in some of Alberta's largest communities. They would seem unlikely to be established in any other places unless there were a massive increase in number of candidates for admission: each institution accounts for high capital and operating costs that have to be borne in large part by the province.

Courses

Where a change might be seen is in the character of the courses in demand. The economic downturn of the 1980s has already boosted the popularity of courses offering skills currently in demand in the marketplace (for example, technical trades and business administration); what is unclear is whether this trend will continue or whether there will be a resurgence of interest in liberal arts and humanities courses, which some observers believe produce more rounded and adaptable individuals.

Primary and Secondary Schooling

Identifying trends in the area of primary and secondary schooling is equally difficult. With respect to organization, the emergence of private, frequently denominational schools as alternatives to public and separate schools may imply a weakening in the present arrangement of educational delivery through school boards. Private school supporters may also become more resistant to the payment of school taxes to the established system and seek a share of provincial education funds.

It is projected that the total population 0 to 19 years of age will decline from 750,700 in 1986 to 746,300 in 1996, and subsequently to 612,800 in 2016. However, this trend need not imply a reduction in demand for schooling. Based on a low growth scenario, the total enrollment of students in Early Childhood Services Programs through Grade 12 is projected to increase from 464,442 students in 1987–88 to 490,472 in 2000–01. There are many reasons for this, including the strong possibility that students will stay in school longer to improve their chances of entering higher education and/or employment. Moreover, retraining will be required as a result of technological and structural changes in the economy.

Lifelong Education

Older persons also may seek further education. The concept of "lifelong education" might translate into growing demand for adult education, both for its own sake and as a means of improving employment chances. Consequently, if there were potentially a sufficient number of adult students, school boards might respond by offering customized courses and, in some cases, continue to make use of school buildings which might otherwise be abandoned.

In the face of these trends, however, the funding of education could become more problematic as the population continues to age. The provincial government's social programs (broadly defined) will increase in cost over a period when the rate of economic growth may be moderate at best. Education may therefore have to compete even more intensely with other social services for budget allocations. Suspension of some programs and resource-sharing among school boards are possible corollaries.

Curriculum

With respect to the content of school courses, the curriculum is set by the provincial government. The content of new adult education courses might be similarly standardized if provincial norms were thought desirable. In recent times, though, there has been some debate over curriculum and course content. The issues have included the desirability of a greater emphasis on basics and how to ensure that the use of technology in teaching does not hinder the development of an individual's mental ability and character. Demands for new occupational skills — including entrepreneurial skills — may be expected as job restructuring occurs.

Significantly, the provincial Department of Education does not see technology being pursued as an independent goal, but as a means to achieve educational ends. Accordingly, the department encourages use of new technology in schools in ways that will enhance technological literacy among teachers and students alike. For example, in an application of computer technology, students could work through instructional software accessed at work stations on the school's local area network (LAN). Application of such technology might prove particularly beneficial in enhancing the quality of learning available at small or remote schools at a fixed or reduced cost.

Possible Trends

Technology, in fact, possesses the potential to replace learning in schools with at home study utilizing sophisticated distance learning techniques. Assuming the necessary self–discipline, it may become possible for adults and older children to study at home using computers, telecommunications links and micro–scale satellite dishes (for reception of direct broadcasts). However, such an arrangement might not be optimal from the child's point of view. He would be unsupervised if both parents were working outside the home and he would experience limited socialization with his peers. For these and other reasons, the conventional mode of learning under the guidance of a teacher in a school room may be more beneficial in facilitating personal development.

Note: More information on educational trends can be found in the contributions by the Departments of Education and Advanced Education in the Compendium of Trends Selected by Agencies of the Alberta Government, Technical Resource #3.

F. Health

The ailments of twentieth-century living are widely known. However, it is also certain that once a particular chronic or infectious disease is controllable, another will take its place. In the face of this reality, it seems likely that medical research and treatment will continue to soak up huge quantities of dollars. At the same time, increasing emphasis may be placed on preventive measures, both to promote "wellness" through self-help and to avoid the costs of treating patients suffering from unhealthy practices or an unhealthy environment.

Health Care Funding

Health care funding is a provincial responsibility, although it is partly funded by the federal government. In some health-related matters, the governments work together while in others they proceed independently. Hospitals policy is determined by the provincial government, which has established hospitals in small communities to improve accessibility to hospital care. Medical research is funded by the federal government and the provincial government independently, the latter allocating monies from the Heritage Trust Fund.

Health Promotion

Promotional efforts are undertaken by both governments. Alberta Health will be placing more emphasis on health promotion, illness prevention and community care, rather than on institutional and clinical care.

The three new strategic directions in Alberta are responses to three stimuli: (i) the realization that 60 percent of the causes of chronic diseases are related to lifestyle or environment and are therefore controllable;

(ii) the expected higher incidence of illness in an aging population; and (iii) the needs of families for the care and support lost with the emergence of smaller, more mobile family units. What is envisaged, therefore, is that people — individually and collectively — will take more of an initiative in helping themselves and each other to lead healthy lives.

Future Concerns

Statistics on health in Alberta indicate some possible areas of future concern. For example, 40 percent of 15–19 year old females smoke, compared with only 29 percent in Canada as a whole. Furthermore, lung cancer among women is increasing: a trend which may lead to cancer becoming the major cause of death among women.

Reponding to the need to set directions for the health system in Alberta, The Premier's Commission on Future Health Care for Albertan's is presently developing recommendations that will enable Alberta, in 2000 A.D. and beyond, to become a province where:

- Each citizen has the opportunity to achieve quality of life through "good health", not only physically, but also in the mental, spiritual, social and economic spheres.
- Albertans, individually and in their families and communities, play the major role in the maintenance and enhancement of their health.
- Albertans, with the appropriate assistance of others, have the opportunity to attain or restore themselves to optimal health, or to die with dignity.

LABOUR MARKET

A. Demand for Labour

The demand for labour will be in major part determined by events in the economic, business and trade arenas.

In Canada, the work force has grown in the postwar years as a result of continued expansion of the national economy. At the same time, the relative importance of the different industrial sectors as employers has been changing. The percentage of the labour force in tertiary (service) industries has grown while the percentages in primary (agriculture, forestry and extractive) and secondary (manufacturing) industries have fallen: a trend evident in other developed countries as well (Table 1).

Restructuring Production

In the future, the global restructuring of economic production is likely to be a major trend with ramifications for the demand side of the labour market. In particular, the rise of non-western manufacturing nations and their impact in forcing developed countries of long standing to reorganize their economies with ever continued uncertainty. Nations are expected to concentrate on developing activities in which comparative advantages are possessed.

Lowering Trade Barriers

Similarly, progress towards the lowering or removal of international trade barriers will be significant as new export opportunities will be opened up, subject to the competitiveness of potential exporters.

However, if a country is able to increase its exports, labour demand may rise. On the other hand, if imports are able to out-compete domestically produced goods, the demand for labour may fall.

Table 1

PERCENTAGE DISTRIBUTIONS OF NATIONAL LABOUR FORCES, BY SECTOR: CANADA, UNITED STATES AND JAPAN, 1956 AND 1981

	1956 Percentages	1981 Percentages
CANADA		
Primary industries	18	7
Secondary industries	33	25
Tertiary industries	48	67
UNITED STATES		
Primary industries	13	5
Secondary industries	34	26
Tertiary industries	53	69
JAPAN		
Primary industries	39	10
Secondary industries	24	35
Tertiary industries	37	55

Note: Primary industries: agriculture, fishing, trapping, logging, forestry, mining, quarrying and oil wells
Secondary industries: manufacturing and construction
Tertiary industries: transportation, communications, trade, finance, service, public administration

All figures rounded to nearest percentage point.

SOURCE: Royal Commission on the Economic Union and Development Prospects for Canada. Report, Volume 1, Ottawa: Supply and Services Canada, 1985. Table 2-12, p. 143.

New Technologies

A third trend is the emergence of new technologies, particularly in the areas of computing, communications, advanced materials, biotechnology and superconductivity. Western countries' expertise in research and development may provide them with a comparative advantage in the development and exploitation of new technologies, creating a demand for scientists and skilled labour (although the new technologies themselves may be less labour-intensive than the industrial production processes which they are replacing).

Note: Please see the submission by the Department of Technology, Research and Telecommunications to the Compendium of Trends Selected by Agencies of the Alberta Government, Technical Resource #3, for elaboration on possible changes in technology.

Trends that may affect labour supply in western countries are the aging of the population, the continuation of low fertility rates and changes in labour force participation rates. Over time, aging and a lower level of natural increase will contribute to a reduction of numbers in the working age-group. The impact on economic activity may, however, be blunted if the mandatory retirement age is abolished. Future economic activities will generally require less labour than present activities.

B. Alberta

Participation in Alberta Labour Force

In Alberta, labour force participation by persons 15 years and over has climbed from 66 percent in 1975 to 72 percent in 1987. Significantly, the male participation rate is in a modest decline; by contrast, female participation has risen from 50 percent in 1975 to 63 percent in 1987 — a trend that will likely continue if

families need two incomes to pay the bills, labour shortages occur and/or more women seek the benefits that employment can provide.

North American society continues to adjust its values and role expectations concerning the role of women in society. Participation rates for Albertans 65 years of age and over have declined, from 15 percent in 1971 to 11 percent in 1986, suggesting that greater numbers are taking early retirement.

Employment in Industries

With respect to industrial structure, the Alberta labour force is dominated by employment in the tertiary sector, which accounted for over 70 percent of the work force in 1986 (Table 2). Within this sector, the two largest industries are services and trade, at 33 percent and 18 percent respectively. All tertiary industries grew in size over the period 1975–86 — with one exception — their shares of the labour force were substantially unaltered. The exception was service industry. Over the same period, secondary industries grew in absolute terms but declined in share. Within the primary sector, agricultural employment declined in both absolute and relative terms while extractive jobs increased numerically and relatively.

Part–time Employment

Part–time employment in Alberta has grown from 12 percent of employment in 1975 to 17 percent in January, 1988, with approximately 70 percent of part–timers being females. Part–time employment may be a personal preference but the percentage often rises with the unemployment rate, suggesting that a reduction in full–time employment opportunities may be a factor. Much of the growth in employment that has occurred in Alberta recently has been in part–time service and trade jobs.

Table 2

EMPLOYED LABOUR FORCES IN ALBERTA,
BY SECTOR AND INDUSTRY

	1975		1986	
	Number (000s)	Percent	Number (000s)	Percent
PRIMARY				
Agriculture	111	14	87	8
Other (fishing, trapping logging, forestry, mines, quarries, oil wells)	28	4	70	6
TOTAL	139	18	157	14
SECONDARY				
Manufacturing	71	9	89	8
Construction	64	8	67	6
TOTAL	135	17	156	14
TERTIARY				
Transportation	69	9	93	8
Trade	147	19	214	19
Finance	36	5	58	5
Service	206	26	383	33
Public administration	57	7	85	7
TOTAL	515	65	833	73
GRAND TOTAL	788	100	1146	100

Note: All figures rounded to nearest percentage point.

SOURCE: Alberta Bureau of Statistics, Alberta Statistical Review.
Table 19 in issues for 3rd Quarter, 1986 and 1st Quarter, 1988.

If the supply of labour in Alberta falls behind demand, employers will have to pay higher wages to encourage more people to enter the work force. International immigration might be required to make up any labour shortage, with consequences for the composition of the population.

In view of slow population growth in European countries, it is unlikely that Europe will continue to act as the principal source of migration for the North America labour market. Already a large proportion of the immigrants coming to Alberta in any given year are non-European and the source of future international migration flows will likely be centres of population increase in less developed countries. As a result, the cultural diversification of Alberta's labour force and population will probably continue.

New Skills

It is certain that individuals in the labour force will have to acquire new skills if they are to participate in activities based upon the development or application of the new technologies which seem to hold the key to future economic prosperity. Alberta already has a substantial advantage in this respect. It already has the highest educated labour force in Canada, proportionately more people holding university degrees than in any other province. Moreover, the situation may continue to improve if recent trends are any indication.

Note: More discussion of labour market trends is to be found in the submission of the Department of Career Development and Employment in the Compendium of Trends Selected by Agencies of the Alberta Government, Technical Resource #3.

ECONOMIC AND SOCIAL OPPORTUNITIES

A. The Development of a Global Economy

Globalization

Simply stated, globalization refers to increasing interdependence among the world's economies. This seems to be a characteric of the last quarter of the twentieth century. This trend affects all aspects of economic activity and is well illustrated by changes occurring in manufacturing, trade and finance.

With respect to manufacturing and trade, a global redistribution of labour and production is under way. For example, Spain and Brazil are replacing Japan and Sweden as shipbuilders, while the United States is closing ground on apparel, steel, and automobiles to Third World countries. As a result, the rate of industrial growth in developed countries is slowing down compared to their growth in other sectors, thereby slowing those countries' overall growth.

Some economists foresee structural unemployment in Canada for the next quarter century and beyond, whatever the state of Canada's foreign trade. Canada's productivity is declining compared to that of its competitors. Industries in newly industrializing countries such as Korea, Singapore, and Brazil — not to mention the USSR and China — will continue to grow, especially since many are developing domestic markets for their own products as they endeavour to reach the levels of prosperity and amenity enjoyed in North America and Europe. These developing countries are able to compete with Canadian manufacturers both in Canada and elsewhere, making questions of free trade and tariffs of renewed importance through the turn of the century.

World Wide Production

An integrated system of world-wide production is emerging. Multi-national firms now produce throughout the world, often drawing on suppliers in numerous industries. Similarly, firms sell throughout the world, so that virtually every country is a potential market for producers in any other country. Engineers and businessmen from Brazil to Korea have instant access to the latest technology and production techniques due to low cost computer-telecommunications networks. The production of an item may therefore be internationalized. Microchips, for instance, are designed in California, sent to Scotland to be fabricated, shipped to the Far East to be tested and assembled, and then returned to North America for sale in computers.

In the 1980s, growing trade imbalances have arisen among major developed countries, sparking protectionist pressures and bilateral trade disputes. Nevertheless, numerous multilateral consultations have taken place. The Canada and U.S. Trade Agreement is part of this international trend towards trade liberalization.

Trade Links

There are historically well-developed trade links with the U.S.A. — to and from which 70 percent of Canada's goods and services flow at present. There has long been a high level of American investment in the Canadian economy, particularly in the manufacturing sector, and there is a growing Canadian presence in the U.S.A., especially in manufacturing and property. The U.S./Canada Free Trade Agreement will provide opportunities for Canada to develop a stronger economy which will be better able to compete internationally.

Patterns of Trade

It may also be in Canada's interest to promote a niche in overseas markets by specializing in products and services

in which it can hold a distinct comparative advantage. Whatever international trade liberalization arrangements are successful, industrialization in some of the developing countries has altered the pattern of comparative advantage in world manufacturing industries. Specifically, the United States, Canada, Europe and Japan are losing some of their dominance in industries such as steel, automobiles, railroad equipment, machinery, appliances, textiles, shoes and apparel to Third World countries, where there is abundant labour which can be paid less than workers in more developed countries. By the year 2000, the Third World may manufacture as much as 30 percent of the world's goods.

Capital Flows

The colossal scale of world capital flows is another aspect of world trade that amounts to about $2 trillion annually; foreign exchange transactions, on the other hand, run around $150 billion a day, or about $35 trillion a year. In addition, the pool of private pension funds of the 24 Organization for Economic Co–operation and Development (OECD) nations is constantly moving and is now $1.4 trillion and expected to hit $3 trillion in five years. Clearly, capital movements as well as trade in goods and services have become a dominant force in the world economy. The economy of money, credit and capital are no longer bound tightly together.

Individual Financial Co–ordination

The future may see greater international co–ordination among governments over financial matters. Structural changes in financial markets and the ability of financial institutions to shift their operations between major domestic and offshore markets have made it increasingly difficult for authorities in a single country to undertake actions in isolation. International economic interdependence, as exemplified by economic

alliances in Europe, North America and the Soviet Bloc can be expected to be further refined. Sources suggest closer integration of international policy-making and the adoption of national economic strategies are strong probabilities.

Increased efforts may be made to co-ordinate trade and aid policies. Fully 80 percent of the world's population will live in the Third World in the last decade of this century and, if economic imbalances continue, international conflict is a real possibility.

Accelerating Pace of Change

All of these trends towards globalization have been evident for many years. What is significant is that each has been accelerating and interacting with the others in an ever more complex fashion. The cumulative effect of these changes is a new world economic order which can itself be expected to change over the years to come.

B. The Rise of Knowledge-based Activities

Knowledge-based Activity

Concurrent with the globalization phenomenon, developed countries have been undergoing a transition from industrial (manufacturing) societies to development, exchange and information application societies. Assisted by developments in computing and telecommunications technology, the generation of knowledge has been accelerating rapidly. As an indication of the volume of new information being disseminated, the number of scholarly journals published around the world has increased dramatically over the course of the twentieth century, growing by over 50 percent in the period 1975-86 alone. Scientists estimate that the world's body of

scientific knowledge probably doubles every decade. This outpouring of information produces new technology so fast that most technology becomes obsolete within 5 to 7 years; within 2 to 3 years in the case of electronics.

The restructuring of industrial societies to information societies is as profound as the earlier shift from agricultural to industrial societies, but with one important difference. The emergence of industrialized societies took 100 years but the present restructuring has taken only two decades.

Information Technology

Developments in information technology have not only been the cause but also an effect of such rapid change: means were needed to organize data that would otherwise be unusable because of sheer volume. This technology has affected — and will continue to affect — the way that people work and organize their institutions. Traditional organization basically rests on command authority, with the flow from the top down. By contrast, in information-based organizations, the flow is circular: from the bottom up and then down again.

Note: For more details on this trend please refer to the section of this Technical Resource on "Technology Beyond 2000".

CANADIAN TRENDS

Canadian Economy

Canada is reflecting international trends in that the rate of growth of information-based activities is picking up. By 2020 the character of the jobs available in Canada, and how they are performed, may have altered dramatically. Some established industrial trades may disappear, to be replaced by service jobs, many of which may be low-skill "robot monitoring" or supporting activities. Other jobs will require new skills.

Much of the new work created over the next 30 years or so will be concerned with the collection, storage, evaluation and dissemination of information. More jobs involved with the protection of people, property and information may also be created if there is a period of social and economic uncertainty.

Manufacturing

Manufacturing is becoming relatively less important as an employer in developed countries. This has given rise to the coining of the term "deindustrialization". It is important to keep this trend in perspective. Taking the U.S.A. as representative of the industrialized world, the number of manufacturing jobs has decreased in the 1980s but is about the same as it was 20 years ago. Manufacturing output, on the other hand, has been rising and has accounted for a relatively constant percentage of the gross national product (around 21 percent in the U.S.A.) throughout the postwar period. But the increased use of sophisticated technology is replacing labour at the same time as service employment is growing.

Within the manufacturing sector, some old industries are in decline. At the same time, whole new industries have been created by technological innovations in such areas as microelectronics and information, biotechnology, ceramics, and composite materials. Some of the new industries, such as robotics, microelectronics, and information processing are transforming other industries, including many of the longer established ones.

Between 1973 and 1985, total employment in the United States grew faster than at any time in the peacetime history of any country — from 82 to 110 million persons. Over the same period, the number of jobs in the service sector jumped from 47.3 million to 72.4 million. A similar

trend has occurred in Canada. By 1995, the increased productivity in manufacturing could mean that manufacturing jobs will account for less than 10 per cent of the work force by the start of the next century.

Changing Industrial Structure

There is no reason to expect that Canadian trends will be any less dramatic. In fact, because of the high level of foreign ownership in manufacturing and substantial reliance on foreign expertise, the changes in Canadian manufacturing might be even more pronounced.

By the turn of the century, however, new information-based services and industries may be expected to contribute some additional employment. There may still be unemployment — perhaps at a greater level than now — but a change in attitudes towards work sharing may improve the situation.

ALBERTA TRENDS

A. Agriculture

Agriculture was the reason for European settlement of the prairies and is still the major renewable resource industry in the region. Even from the beginning of the century, however, the fortunes of the agricultural sector have been changeable: weather, prices and pests contributing to cyclical occurrences of "feast and famine". Together with the modernization of production techniques and the maturing of agriculture from a way of life to a business, this vulnerability has resulted in many changes in rural life and communities. The character of agriculture has been undergoing continuous change and shows every sign of continuing to do so.

Long-term Change

Some of the long-term changes experienced by Alberta agriculture have been decreasing numbers of farms, consistent increases in average farm size, shrinking of the farm population and increases in the number of farm families with at least one member in off-farm employment.

In the more recent past, agriculture has been affected by a number of other phenomena including rising input costs, surging farm debt, falling land values, adverse weather conditions and increased competition in overseas markets from more heavily subsidized producers and new production sources. Just how long these factors will remain in force, and whether they will become established trends, remains to be seen.

Direction of Change in Agriculture

Despite the fickle nature of factors affecting the state of Alberta agriculture, it is possible to suggest possible directions of change which are likely to remain evident into the 21st century. First, the contemporary trends in farm numbers, size and population will probably continue. Second, agricultural production appears likely to become even further concentrated. Already a small number of efficient, large-volume producers account for a disproportionately large share of gross agricultural production, 5 percent of producers being responsible for 33 percent of the output. By the year 2000, 20 percent of farms may account for as much as 80 percent of production, thanks to the advantages attached to size, including the capital resources permitting the acquisition of new technology, the ability to operate profitably on a high volume-low margin basis and the purchasing of inputs at a discount.

The smaller producers who are unable to expand will either continue to rely on income from off-farm employment to break even or turn to other occupations. At the present time, there is a clear northward

increase in the percentage of farm operations depending on off-farm income, ranging from 33 percent in the south to 59 percent in the Peace River block. Consequently, further developments in favour of large operations may quite seriously affect agriculture and rural communities in central and northern districts.

Agribusinesses

Third, the operation of farms as businesses will become more crucial for success in a global environment where traditional export markets are no longer guaranteed. Financial management skills will have to be developed, advantages taken of technological breakthroughs, products diversified and new markets opened up. It is possible that a greater business orientation could also usher in corporate farming, on the American model. However, an Economic Council of Canada study has projected that the commercial family farm will remain the dominant type of Prairie farm, responsible for the bulk of farm output (Au Courant, 9, 1, 1988).

Note: For greater detail, see the Department of Agriculture's submission in the Compendium of Trends Selected by Agencies of the Alberta Government, Technical Resource #3.

B. Forest Industries

Integrated Resource Management

Most forested land in Alberta is owned by the Crown. Consequently, provincial government policies and programs will play a critical role in determining how the resource is developed. In this regard, a system of integrated resource management is already in place for planning the use of the province's forests for multiple purposes including: logging; wildlife habitat; watershed protection; erosion control; and recreation. The objective of the system is to minimize land use conflicts and make better land and resource use decisions.

External Demand for Forest Products

The future of Alberta's forest industry would therefore seem to depend on provincial and external demand for pulp, paper and lumber; the adequacy of the timber supply; technological innovation; and the opportunities provided for logging development in management plans. Sub-regional plans are still in preparation and it is possible that the needs of the other uses may result in limits being placed on the amount of logging permitted. Indeed, limits are already imposed by the province's policy of limiting the amount of timber cut to the amount of new growth, thereby ensuring a sustained yield and the long-term maintenance of the resource.

Recently, a new pulp and paper mill has been announced for Athabasca, pulp mills for Peace River and Slave Lake, a newsprint mill for Whitecourt and pulp mill expansions for Hinton and Grande Prairie. These and other processing developments will account for a capital investment of $1.3 billion over the next decade, creating perhaps 15,000 jobs or more in the forest and related industries. Alberta will thus have the plant in place to meet anticipated future demands. Moreover, technological advances continue to increase the level of utilization of the forest resource. Already it is possible to process wood chips and trees once regarded as being of low value (e.g., aspen).

Reforestation

The long-term maintenance of the resource will be ensured by the government's insistence on reforestation of harvested land. High quality seeds and seedlings are available from the government's forest nursery.

Note: For greater detail see the Department of Forestry, Lands and Wildlife's submission in the Compendium of Trends Selected by Agencies of the Alberta Government, Technical Resource #3.

C. Energy

When considering the local state of an industry like oil and gas, it must be recognized that global events and trends are the dominant controlling factors. Consequently, any discussion of trends within the Alberta industry has to be based on explicit assumptions concerning the future level of world prices – which influences the amount of exploration, development and production, the extent of alternative energy development and the level of energy conservation. Any international efforts at containing the global warming trend by reducing the demand for fossil fuels will also be significant.

Energy Conservation

Energy conservation is an important factor. Between 1973 and 1982 — a period of high oil prices — the OECD countries (the major western countries) reduced their oil consumption per unit of economic activity by about 29 percent. This caused the overall energy consumption per unit of an activity to fall by close to 15 percent. However, preliminary indications are that, following the oil price declines in 1986, energy use in Canada and the U.S.A. appears to be on the rise again.

Alternative Trends

In the future, the mix of energy types in developed countries may change, particularly if advances in transportation technology result in more fuel–efficient engines. In the developing countries, demand is expected to increase but it is not at all clear that industrialization there will prove to be as energy–intensive a process as it was in the industrialized world. On the other hand, the substitution of petroleum derivatives (such as plastics and composites) for metals in many products may maintain the demand for petroleum as long as diminishing reserves of minerals keep their prices high. On the supply side,

a large portion of the industrialized world's crude oil supplies will continue to come from politically unstable areas. Thus, there are continuing risks of disruptions in supply and instability in oil prices.

World Oil Prices

The Alberta Energy Resources Conservation Board (ERCB) has had to make an assumption concerning future world oil prices in order to forecast the level of resource production required to satisfy a number of demands between 1988 and 2002. They made assumptions about Alberta's energy requirements, the needs of out-of-province markets and the requirements of Alberta petrochemical, fertilizer and other industries using energy resources as feedstocks, between 1988 and 2002. The Board also made specific assumptions concerning such factors as new production and refining capacity in the province and the external demand for petrochemicals.

The Board postulated that oil and gas prices would rise gradually, the capacity of existing oil sands plants would be increased, a new oil sands project would come on stream, a heavy oil upgrader would be built and the petrochemical capacity would be expanded. However, additional oil refining capacity was not felt to be warranted.

It is well recognized that world oil prices are a reflection of international conditions of supply and demand over the long term and the quantities supplied or demanded at a specific point in time. Over the long term to 2020, it is apparent that some conventional sources of oil will be physically depleted or exhausted leading to the belief that long term availability of conventional oil supply will be restricted. Thus there is anticipation among experts that the long term trend will be to increase cost and price of

oil supplies. At any particular point in time however, current market conditions may or may not result in a price that reflects the long-term trend.

Conventional Oil

Based on these assumptions and data on oil reserves, the ERCB concluded that conventional oil production in Alberta would gradually decline (a trend already in place) while production of raw bitumen (the raw material of synthetic crude oil) would gradually increase. Indeed, by 2002, the amount of raw bitumen produced may equal the energy value of the conventional oil produced in 1982 (Figure 5).

Natural Gas

Natural gas production is expected to increase rather rapidly through the 1990s but begin to decline in 2002 due to diminishing reserves.

Coal

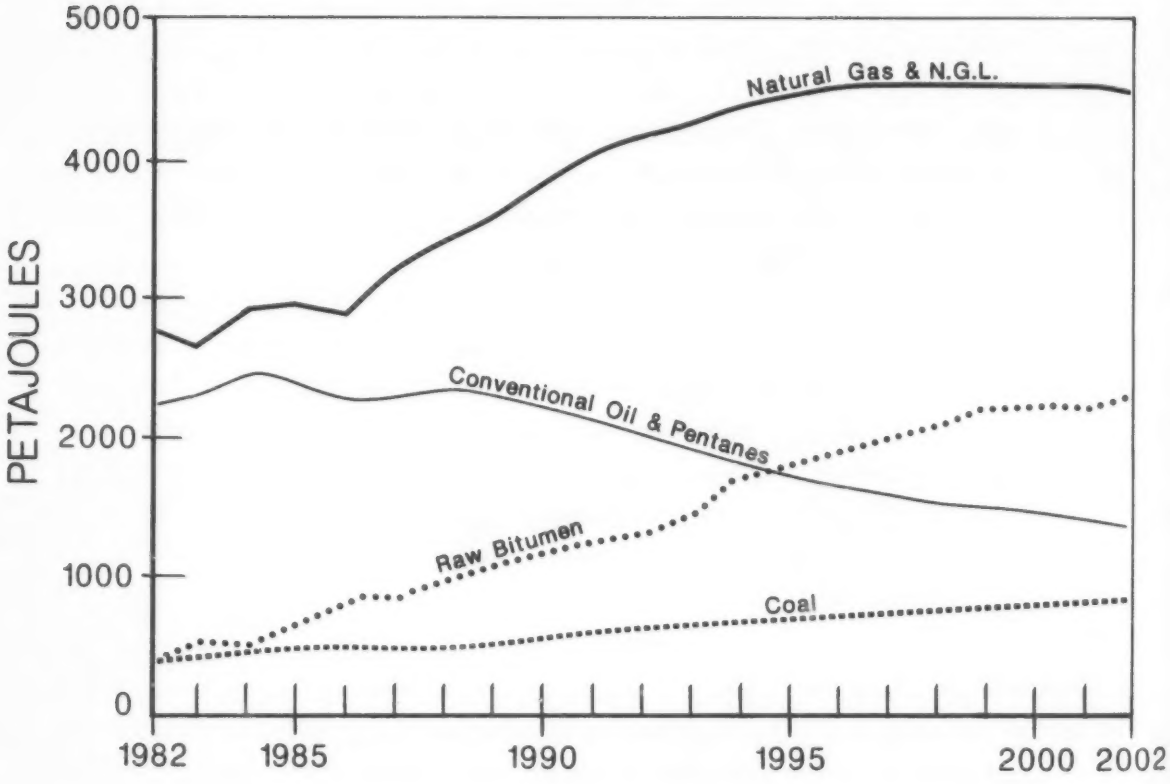
The ERCB also identified trends in the production of coal. Unlike oil and gas, the major market for coal (in terms of volume) lies within the province, in electrical generation. Due to increased Alberta demand for electricity and increased exports of bituminous coal to central Canada and the Pacific Rim, total coal production is expected to rise slightly.

D. Secondary Industry

The secondary (goods-producing) sector consists of manufacturing and construction, which together account for fourteen percent of the province's labour force. Manufacturing employment makes up just over half of this share. (This figure may be deceptive as the census includes service-type activities such as baking and newspaper publishing within the category of manufacturing.) "True" manufacturing industries in Alberta include: food processing; oil refining; petrochemicals; pipelines; oil industry equipment; clothing; and a variety of high-tech enterprises.

FIGURE 5

Alberta's Energy Resource Production 1982-2002



N.G.L.= Natural Gas Liquids

SOURCE:
Alberta Energy Resources Conservation Board.
Energy Requirements in Alberta:
Supplementary Report 1988-2002.

For a number of years, the provincial government has encouraged the diversification of the economy in an effort to reduce reliance on primary resources, which are particularly susceptible to volatility in international markets. Further diversification may be expected, particularly into the area of high technology, building on the province's present strengths in computing expertise, medical research, petrochemical production and other fields.

At the present time, the province's manufacturing is concentrated in Edmonton, Calgary and several other urban centres (as well as a few rural localities where petroleum and petrochemical industry activities occur.) This pattern may undergo little change unless new industries, which require few local industrial linkages, are established in communities with little history of manufacturing. This could happen as a result of the locational flexibility allowed by advanced telecommunications links.

E. Tertiary Industry

Most working Albertans are employed in tertiary activities of one form or another, and — judging by the international trends discussed earlier — the tertiary workers' proportion of the labour force will rise even higher than it is now.

In the 1960s and 1970s, much of the growth in tertiary employment was due to expansion in the areas of education, health and public administration, but in the 1980s public employment growth has been sharply curtailed. The principal reason for future growth in tertiary employment may therefore be growth in retail employment, financial services and high-tech services.

Generally, the variety and number of tertiary activities increases with the size of a place. Indeed, certain activities may be found only in the province's largest centres. Retailing is the most widely distributed tertiary activity but even within this industry the sizes and types of store vary according to the size of place.

Between 1977 and 1985, the number of retail outlets in most Alberta communities increased, albeit with greater gains being registered by the larger places (where the variety of retail businesses was wider). Geographically, the places making the largest gains fell within (1) the Calgary–Edmonton corridor; (2) a belt stretching from Bonnyville through to the Peace River block; (3) the Lethbridge area; and (4) the Medicine Hat area. The communities experiencing below–average growth in outlets tended to be agricultural service centres in prairie Alberta outside the Calgary–Edmonton axis. Places which experienced an absolute loss in number of outlets were characteristically some of the province's smallest centres.

F. Tourism

World Scene

Tourism incorporates a variety of activities including travel, accommodation, catering and the development and operation of attractions. A distinction may also be drawn between business travel and leisure travel.

Growing Travel

The future of tourism in Alberta is likely to be influenced by a number of world trends and a number of more local factors. On the global scene, there is, first, growing two–way travel between the western world and east Asia, both for business and leisure purposes. Second, the desire to engage in outdoor recreation, is becoming a

more important a factor in people's selection of vacation destinations. Consequently, the abundance of clear, open wilderness areas in Alberta could prove beneficial to the province in attracting visitors from many sources.

Moreover, the relative freedom of Alberta from acid rain precipitation promises good fishing, clean water and an unblighted forest resource — factors which should heighten the appeal of the province to eastern Canadians and people from the United States.

Third, there is no evident decrease in the use of automobiles as means of travel; in various parts of the world including Canada, increased use may be expected. With its high quality roads and well-developed road network, Alberta may therefore expect to host more Albertan and out-of-province travellers driving their own vehicles or renting locally.

No statements can be made with any certainty about the out-of-pocket cost of tourism or the amount of leisure time available. Most forms of tourism involve a measure of travel, which requires the consumption of fuel. If energy prices rise, therefore, tourism becomes more expensive for the individual family or business. Either the additional costs will be absorbed by tourists or they will alter their plans, perhaps not travelling so far.

Leisure Time

The amount of leisure time available in the future is equally open to debate. Some people believe that the work week will shorten — whether because of trade union pressure, the application of new technology or other reasons — while others think that the continued survival of the two income household will constrain the time available for the family to engage in leisure activity together.

Local Factors

Local factors which may have a bearing on Alberta tourism include the availability of accommodation and the availability of labour. Regarding accommodation, the province currently has an oversupply of registered rooms (the provincial occupancy rate in 1987 being only 60 percent.) Thus, on the face of it, there is unlikely to be a shortage of space for visitors for many years to come.

Labour in Service Industries

Labour shortages, on the other hand, are a real possibility. Just at a time when the accommodation and food service industries are expected to grow, the number of young people — on whom the hospitality industries have traditionally relied for staffing — will be falling. Adequate help may not be forthcoming unless higher wages or other incentives are offered to attract older people.

The other major demographic change, the aging of the population, may also prove significant. The increasing popularity of recreation vehicles, no doubt stemming in part from the measure of affluence afforded senior citizens by Canada and private pension plans, may necessitate greater provision of appropriate campground facilities, as opposed to solely hotel-type accommodation, for the elderly segment of the market.

Note: For more details on tourism please refer to the Department of Tourism's submission in the Compendium of Trends Selected by Agencies of the Alberta Government, Technical Resource #3.

G. Recreation

The sporting, recreational and fitness activities pursued in the future will be influenced by many of the trends identified elsewhere in this publication.

Increased Demand for Recreation	In future, greater reliance may be placed on recreational services as a means of fulfilling innate social needs since the increasing automation of work may reduce the amount of social interaction in the workplace. People may also respond by seeking longer vacations and more frequent sabbaticals, engaging in job–sharing or part–time work and/or taking early retirement. If the numbers of sedentary jobs increase, more people may wish to engage in physical activities during their leisure time.
Negative Influences	Home entertainment and education based on electronic technology (e.g., videos and computers) may reduce the demand for the provision of formal recreation activities outside the home. As with the automation of the workplace, people may look to recreational services to satisfy their need for gregariousness. The increase in ultra–violet radiation which would result from the continued thinning of the ozone layer could curtail outdoor recreation due to a higher risk of skin cancer. Aquatic life would also be affected, diminishing the quality of the province's fishing resources. Climatic warming could also adversely affect agriculture in some areas but might be of some benefit to recreation. The growing support for the concepts of sustainable development and environmental conservation may lead to a growth in the popularity of quality outdoor experiences and near–urban outdoor recreation opportunities.
Impact of Population Aging	The aging of the population will increase the demand for seniors–oriented programs and sporting activities and reduce the need for specifically youth–oriented activities and facilities; arenas and pools may have to be

transformed into multi-purpose community centres. The social and therapeutic aspects of sport, recreation and fitness may receive more emphasis. The swelling numbers of seniors and early retirees, however, will increase the pool of potential volunteers required to administer community activities.

The changes in family structure and the rising labour force participation rate are necessitating the scheduling of organized recreational activities at varying times rather than at a single time. Moreover, the sports, recreational and fitness needs of particular ethno-cultural groups may have to be met as Canadian society becomes ever more multicultural in nature.

Integrated shopping and leisure facilities may become more widespread since the climate discourages outdoor activities during a large part of the year and shopping is a form of leisure for many Albertans.

The expected rapidity and scope of change in the world of the future may call for formal leisure education to help people cope with change and appreciate the importance and value of recreation in the new society.

The trend towards deinstitutionalization of the disabled may lead to handicapped people being integrated into regular recreation programs, with implications for staffing and funding requirements.

Note: Further information on recreation trends is to be found in the contribution of the Department of Recreation and Parks to the Compendium of Trends Selected by Agencies of the Alberta Government, Technical Resource #3.

H. Culture

Public Demand

One of the strongest cultural trends in Alberta is a growing public demand for cultural activities, experiences and services. Audiences for organized cultural events, attendance figures at museums and historical sites and the circulation of library materials are rising. Many Albertans are actively involved voluntarily in the administration of these activities. The provincial government, realizing the importance of heritage attractions to community life and tourism, has developed a network of museums, interpretive centres and historic sites across the province.

As with recreation, some of the principal trends discussed elsewhere in this technical resource seem capable of initiating new trends. Evolving telecommunications technology will give many people access to cultural activities previously available in only a limited number of localities. The growing strength of interest groups and the implementation of the principles of participatory democracy may result in the public demanding more cultural services.

The aging of the population may lead to demands for a set of cultural services different to those delivered to a more youthful population. Similarly, increased international immigration may have an effect on the nature of the services required. The urbanization of the province may also be significant as arts involvement increases with population density.

By contrast, changes in the character of the labour force could reduce the vitality of cultural life in the province. The increasing female participation in the labour force and any growth in the necessity for some Albertans to take two jobs could make a substantial dent in the number

of volunteers engaging in cultural activities. Moreover, unemployment or underemployment in younger age groups would restrict the amount of disposable income available and might therefore limit those groups' access to leisure pursuits.

The progressively rising level of education among Albertans implies that a rising level of cultural participation may be expected: studies have shown that the two are linked.

Note: For additional elaboration of cultural trends please refer to the Chapter by the Department of Culture in the Compendium of Trends Selected by Agencies of the Alberta Government, Technical Resource #3.

PHYSICAL AND FUNCTIONAL TRENDS

A. Introduction

Character

By contrast with the trends discussed in the other chapters, environmental trends can result from causes other than the activities of man. The other trends represent the outcome of decision-making by individuals or groups of individuals in the area of the environment. Trends may be due to "natural" physical forces occurring in isolation, the activities of man or a combination of the two. It is often difficult to determine whether so-called "natural" events are actually a part of a sequence of events of a particular character that will extend over a long period of time, or whether they are simply part of a shorter-term cyclical fluctuation.

Man and Environment

Man's interactions with the environment are so varied and so complex that it could be argued that most environmental trends are the result of interrelationships between natural forces and human activities. For the sake of completeness, references will be made to all three categories of cause in the paragraphs that follow.

B. Climatic Change

Climatic Warming

There are strong indications that the global climate is warming. What is unclear is whether warmer, drier conditions are temporary or liable to be long-term. The most dramatic evidence is in the Sahel region of Africa, where desert areas are spreading (although land mismanagement is also a contributing factor). The consequence for that area has been the widespread occurrence of famine. Closer to home, recurring seasonal drought in the Canadian Prairies and the American Great Plains in recent years provides further testimony of climatic change.

Statistics show that the annual average global temperature has been rising since 1880 (the beginning of reliable record-keeping) and the possibility exists that by the mid-21st century, the world may be 4°C warmer than two centuries earlier. However, this outcome is very uncertain.

Historical Climatic Changes

Historically, climate has fluctuated by several degrees over the course of cycles lasting perhaps several centuries. Such cycles may be regarded as natural occurrences, free from any major influence of man. The current trend could therefore be nothing more than the upswing of a cyclical fluctuation which will be followed in due course by a lowering in temperature.

What is unclear is the extent to which the present changes result from various activities of man. Carbon dioxide, which is a product of the burning of fossil fuels, is just one of a number of gases whose presence in the atmosphere has increased markedly. This and certain other gases trap infrared radiation that would otherwise dissipate into space.

Greenhouse Effect

Thus, any build-up of carbon dioxide will lead to atmospheric warming: the so-called "greenhouse effect". Consequently, it is possible that the present warming trend is primarily "man-made", in which case the trend should be controllable if a concerted effort is made to take corrective action (e.g. the substitution of alternative energy sources for fossil fuels such as coal, oil and gas).

The suggestion made by some experts is that a greenhouse effect has been superimposed on "natural" temperature fluctuations. It has also been speculated that, even if other factors were to counter the greenhouse effect over

the next 20–30 years, the temperatures presently experienced will prevail — until the next "natural" ripple in the weather system raises them again. If these opinions prove correct, climatic warming must be regarded as a genuine trend which it may prove impossible for man to offset. Accordingly, drought, the spread of deserts and changes in the agricultural capability of regions may become permanent features on the planet. Moreover, the melting of the polar ice caps will raise sea level, inundating some coastal lands and parts of many coastal ports.

Warming in Canada

Among the global trends climatic warming is currently the most publicized in Canada. As an economy trading in agricultural commodities, forest products and fossil fuels, and as a world leader in energy consumption, Canada is more vulnerable to changes in climate than many other industrialized nations. Virtually every region of Canada would be affected by even a moderate warming trend and the associated changes in precipitation patterns.

Scientists suggest that the vast agricultural area of western Canada would expand northward (subject to soil limitations) and that more southerly areas will become more arid. Parts of the prairies could therefore experience higher wind erosion, shortages of irrigation water and more frequent drought conditions. In central Canada, the Great Lakes water levels will decrease, resulting in a reduction of annual water overflow, with consequences for seaway transportation and hydro–electrical generation. Northern areas would enjoy a lengthened growing season with a shorter annual duration of ice cover on lakes and rivers. The west and east coasts could suffer from inundation and/or changes in fish migratory patterns if a significant melting of the polar ice caps were to occur.

Measures to contain the warming trend would thereby have to include a reduction in the burning of fossil fuels in residential and industrial uses and the substitution of clean-burning energy forms, for example, hydrogen.

C. Acid Rain

Sulphur Emissions

There is a trend to increasing public concern about the effects of acid rain. Sulphur compounds emitted from the smokestacks of industrial plants and some coal-fired power stations react with atmospheric moisture to form sulphuric acid, which is precipitated as rainfall. Alternatively, the compounds react with water in rivers and water bodies, raising the acidity of the water. The net result of both processes is that terrestrial and aquatic flora and fauna may be affected. For example, tree growth may be stunted and fish less able to survive, possibly culminating in reduced genetic diversity.

Most of the sulphur emissions are occurring in the developed countries of the world but, due to the movement of weather systems, acid rain precipitation occurs outside as well as within the borders of the sulphur-emitting nations. In Europe, sulphur emitted in the United Kingdom has come to ground in Scandinavia. In North America, U.S. emissions are observed to affect central Canada while emissions from Sudbury, Ontario affect the eastern U.S.A.

Increased precipitation of acid rain is another phenomenon of concern. Most of the sulphur falling on Canada as acid rain originates in the emissions of upwind manufacturing plants in the United States and therefore international action is needed. Alberta, fortunately, is largely free from acid rain but areas downwind from tar sands plants in northern Alberta could be affected detrimentally.

D. Hazardous Wastes

Disposal of Hazardous Wastes

One of the most serious consequences of synthesizing materials through chemical and physical technology has been the production of extremely hazardous products (by–products of the manufacturing process or end–products which are spent but not degradable). The output of such products appears to be increasing in step with world economic growth but, to date, economical methods for disposal have not been perfected. Alberta is a leader in hazardous waste disposal techniques. Some products cannot be completely destroyed without detriment to air, water and/or land and are simply stored, with various lines of defence taken to insure against leakage or contamination of the adjacent area.

The problem of disposal — or, more accurately, non–disposal — is graphically illustrated by two events in the summer of 1988. First, the forced evacuation of local residents near Montreal when PCBs (Poly–Chlorinated Biphenyls, elements of the coolant used in electrical generators) stored in a warehouse were set on fire, resulted from the formation of toxic by–products due to incomplete combustion. Second, several European countries refused to allow a boat containing hazardous wastes recovered from an illegal dump site in west Africa to enter their waters. Incidents like this may become increasingly frequent unless hazardous wastes can be destroyed without adverse environmental consequences or industries are discouraged from manufacturing or using products which leave behind such a deadly legacy.

E. Other Forms of Pollution

Greater Awareness

It is difficult to assess whether the level of environmental pollution in the world is changing. Much research is needed to determine whether the environment is generally becoming more polluted — or less — with man-made waste materials, gaseous, liquid or solid.

Aerosols

Several specific observations can be made. It is suspected the use of aerosols is contributing to the thinning of the ozone layer which protects the earth from the harmful effects of ultra-violet rays from the sun. Too much ultra-violet radiation causes skin cancer, eye cataracts and damage to crops such as cotton and soy beans. It also poses a threat to the human immune system and can contribute to changes in global climatic conditions, e.g. a rise in the earth's temperature. The reason for this thinning is that the propellant in aerosol containers is a chlorofluorocarbon, which depletes the ozone layer. International accords were signed in Montreal in 1987 to restrict the production and use of chlorofluorocarbon compounds but it remains to be seen whether this action will be sufficient to prevent further deterioration of the ozone layer.

Lead Emissions

Developed countries are increasingly instituting measures to reduce lead emissions by motor vehicles. In North America, the federal governments are reducing the maximum permissible lead content of leaded gasoline and encouraging the production of cars using unleaded fuel. It is to be hoped that this trend towards cleaner emissions from automobiles will be taken up by other countries.

F. Deforestation

Reduction in Forest Cover

The world's forest cover is being reduced, primarily for two reasons: the cutting of trees for commercial purposes without adequate regeneration and the clearance of forest land for conversion to agriculture. The rate of deforestation seems to be increasing. Tropical forests have been shrinking by 11 million hectares per year, and it is estimated that 31 million additional hectares in industrial countries are damaged, apparently by air pollution or acid rain. Moreover, in Bangladesh, the increasing frequency of devastating floods can be attributed in part to the clearance of slopes in the Himalayas. Topsoil blown or washed into the upstream portions of a river results in greater deposition downstream and an increased risk of flooding. Alberta's reforestation policies should prevent any large-scale deforestation occurring here.

Agricultural Conversion

Deforestation is occurring in Canada as a result of clearance of woodland for conversion to agricultural uses and because of controversial practices such as clear cutting in the forestry industry. Concerted efforts are being made to ensure regeneration of species, and to prevent further shrinking of the forest resource base.

G. Sustainable Development

Sustainable Development

In 1987, the United Nations-sponsored World Commission on Environment and Development, (the Brundtland Commission) issued a report which reviewed the world's environmental problems and concluded that all countries should seek to achieve a goal of "sustainable development". The Commission recognized that economic development was essential to meet the needs

of current and future populations, but argued in favour of development which would not lead to the deterioration of the environment, to the detriment of future generations. It suggested, among other things, that an international U.N. program for sustainable development be initiated and that international assistance agencies should require environmental impact assessments when arranging aid to developing countries (a recommendation since implemented by the World Bank).

Environment of Canada: National Task Force

Subsequent to the publication of the Brundtland Report, a National Task Force on Environment and Economy established by the Canadian Council of Resource and Environment Ministers published a report accepting the principle of environmentally sound and sustainable economic development and containing some forty recommendations in support of this goal. This action was significant because the Task Force was composed of representatives from business as well as government and an environmental concern group.

Time will tell whether such reports will have a profound effect on the thinking and corporate behaviour of the world's businesses and governments. However, the federal and provincial governments in Canada have already endorsed the Canadian Task Force's report and the individual provinces are now developing conservation strategies for their respective jurisdictions. Locally, the Environment Council of Alberta has produced discussion papers and will soon be holding public hearings related to a strategy for this province.

Environmental Conservation

Growing appreciation of the need for environmental conservation and environmental health would seem likely to continue, in view of the crucial need to maintain air and water quality. Public demand for environmental accountability will increase the pressure on waste-producing industries to use the best pollution control techniques available to limit negative effects on health, vegetation and buildings.

H. Other Global Trends

There are a number of other trends which can be identified; the depletion of non-renewable resources; the loss of wetland to agriculture; the increasing adoption of recycling strategies; the lowering of water tables in parts of Africa, China, India and North America as demand exceeds aquifer recharge rates; and the reduction of genetic diversity through plant and animal extinctions resulting from man's activities (one-fifth of all species may disappear over the next twenty years).

I. Other Canadian Trends

Drainage of Wetlands

Drainage of wetlands to increase agricultural land has been gathering momentum in Canada. Wildlife habitat is being lost and local ecosystems affected, particularly in the prairie provinces. Increasing numbers of visitors to recreation areas are also stepping up the pressure on fragile ecosystems such as the eastern slopes region of the Alberta Rockies and foothills.

Irrespective of climate, agricultural, industrial, urban and recreational demands for water are expected to increase with the growth of economic activity. Water shortages for specific applications are likely to be an ongoing problem for the next forty years.

A. Broad Municipal Trends

Municipal Trends

Three general trends affecting the operations of municipal governments can be identified: growing complexity, increasing interdependence and rising costs. Typical of most trends, these are closely interrelated. It is useful to examine each in some detail so that each municipality can assess whether any or all apply to their community. All three trends are evident to some extent in a municipality, but whether they are significant is a decision that councils need to make.

The three trends are caused in part by global trends and in part by what is happening in Alberta today. There are no indications that the underlying factors which drive these trends will change in the foreseeable future.

1. Increasing Complexity

Complexity

If municipal operations and council responsibilities are viewed over a period of, say, twenty–five years, it is apparent how much more complicated the operation of a municipality has become. The growing complexity is a result of the way the global economy is developing, the nature of technological innovation and the changing attitudes of citizens.

Furthermore, there is general agreement that the rate of change is increasing. Thus by extension, municipal government will likely continue to grow more complex. Some illustrations of this complexity are given below.

Issues

First, the municipality of today must deal with a greater number of issues. For example, there is growing involvement in recreational and cultural activities, some of which were unknown twenty–five years ago. For the future, broader involvement in human cultural development by municipalities seems most likely.

Technology

Second, with technological changes the sophistication of the information and skills required to make a rationale decision is growing. This has led to the need for more specialized staff and the growing use of outside assistance. Outside assistance may also be required when municipal road equipment incorporating new technology has to be repaired: fewer and fewer repairs can be done "in house".

Decision–making

Third, there is a growing understanding of the broader impact of decisions made at the municipal level. For example the decision to change a bus route has implications not only for the level of ridership but also for the volume of traffic on a road, the fortunes of the businesses along the road, the cost effectiveness of public transit and the need for school buses.

2. Increasing Interdependence

Interdependence

There is a growing realization that a municipality "is not an island". Joint efforts by a municipality and adjacent municipalities and/or other agencies are becoming more and more prevalent and there is every sign that the future will be characterized by increasing interdependence.

At this time there are many functions performed on a joint use basis in Alberta communities. For example, school grounds, community schools, etc., are operated for the benefit of community users as well as the students.

There appears to be a strong trend to partnership operations between governments. In areas such as information sharing, delivery of social programs and others, there is likely to be increased partnership in the delivery of services. For example, the Land Information Branch of Alberta Forestry, Lands and Wildlife notes that there will be an "increasing need to integrate activities with neighbouring municipalities and other levels of government".

There is a continuing trend for more and more people to live in one municipality but work, shop, or seek recreation in another municipality. This has an effect on municipalities' tax bases. In a direct way one municipality may be providing recreation facilities (e.g. an arena) for residents of another municipality.

The increasing sophistication of municipal operations is another area which is causing growing interdependence. For example, some small municipalities are having difficulty finding qualified staff to operate water treatment facilities. Such municipalities may be able to share experienced operators with other communities, even to the extent of forming regional boards to service and maintain individual water systems.

B. Municipal Financial Trends

Short term and long term trends in municipal finances will be determined by a number of factors including the size of trends for payments, growth of the assessment base, and the decisions of councils concerning expenditures on municipal services and functions.

The economic downturn of the early 1980s gave impetus to the search for greater operating efficiency by municipalities throughout the Province. At the same time recent decreases in the capital finances 'available' and 'applied' over the past four years may reflect slower growth in the economy and the demand for services and suggests that municipalities have achieved the level of capitalization desired for the present economic circumstances.

For a discussion of recent trends in municipal financing reference may be made to Municipal Finances: Statistical Summary 1985 (Municipal Services Branch, Alberta Municipal Affairs, 1987).

Since the individual circumstances are particular to each municipality, it is recommended that if elaboration of financial trends is required, participants in Vision 2020 should obtain specific information through their municipal facilitators.

Costs

Alberta communities have faced rising costs in the past and dealt with the issue very successfully. There are indications that rising costs may continue to be a feature of municipal operations in future years.

Expectations

One of the main sources of increasing costs is the rising expectation of residents for more and better services. Typically, services offered by municipalities are people–oriented. This type of service does not lend itself well to automation.

Replacement of Infrastructure

Possibly the most significant contribution to rising costs will be made by the replacement of existing infrastructure such as roads, sewers, and buildings and, to a lesser extent, the provision of more services for the elderly.

There are three aspects to the infrastructure cost increase. First, the facilities installed twenty or thirty years ago in some municipalities are deteriorating. Second, the standard of services now required is rising. Third, the cost of repairing infrastructure is overtaking the cost of new construction.

Facilities for the Elderly

The aging population will result in greater resources being allocated to provide services and facilities for the elderly. In the face of this phenomenon, municipalities may be faced with requests to consider supplying such amenities as care services, drop–in centres, handicapped access to buildings, senior citizen housing, ambulance service, seniors–oriented recreational facilities and campsites designed for large recreational vehicles.

SERVICES

A. General

Demand for Service

There is expected to be a tendency towards increasing demand for municipal services. The hard services, such as water, wastewater, and solid waste disposal will have to

compete with the 'softer' (people) services for funding. In urban municipalities, major funding will be required to maintain current standards of services because existing municipal 'hard' (infrastructure) services are aging and deteriorating.

Conservation techniques may be increasingly used to avoid or minimize replacement. Such techniques could include water metering, water restrictions and staggered work hours to ease demand for transportation and power. Difficulties of finding new landfill sites may also result in new emphasis on reducing the amount of waste landfilled.

B. Water Supply for Urban Uses

Drinking Water

There will be a continual increase in public concern on the quality of drinking water. Currently, public expectations and demands for quality drinking water place pressure on the practical limits of production and delivery. Municipalities have responded by improving plant operations with processes that will alleviate the aesthetic problems associated with drinking water, colour, taste and odour.

The major communities in the province will have adequate water supply to meet their growth needs. However, many smaller communities using groundwater and intermittent surface waters may face difficulty in locating adequate supplies.

There is expected to be a tendency towards more sophisticated management of water systems with emphasis placed on water pricing policies which reflect the value rather than the cost of the resource. Water conservation will be encouraged.

C. Wastewater

Wastewater

There is expected to be an increased public demand for pollution–free rivers and lakes, even though Alberta municipalities have one of the highest standards of wastewater treatment in Canada. Large municipalities in Alberta are currently required to remove solids and organics; Calgary is also required to remove phosphorus. In the near future, all major municipalities are expected to be required to remove phosphorus. This may be followed by a requirement for disinfection and ultimately for filtration of wastewaters.

In some areas, the trend will be away from conventional technologies to more innovative solutions to wastewater disposal. There is a growing intolerance for the use of lagoons even though these are an effective wastewater treatment system. Finding sites for lagoons is becoming extremely difficult for a small community because of the "Not in my Backyard" attitude of people who live in areas surrounding potentially suitable sites.

D. Solid Waste

Landfills

Like lagoons, landfill sites are becoming more difficult to locate. This will make landfill sites an ongoing problem requiring inter–municipal co–operation. Municipalities will be siting new facilities long in advance, with the facility being planned (including its final reclamation) through its entire life cycle. As a result of difficulty in finding new landfill sites, municipalities can be expected to attempt to conserve the facilities they have by recycling programs that will reduce the volume of material being deposited in the site.

Note: For more details on the above trends please reference the Department of Environment submission in Compendium of Trends Selected by Agencies of the Alberta Government, Technical Resource #3.

E. Transportation

Several categories of transportation trend may be identified: first, trends in the patterns of movement of people and freight; second, trends in the provision of facilities to accommodate the flows; third, trends in the type of transportation preferred; and fourth, trends in vehicle design.

Urbanization

The increasing urbanization of the province implies that the number of trips within urban communities may increase, with ramifications for street capacity, construction and maintenance.

Rural Trends

New resource developments (including new recreation areas) must be adequately linked to the existing highway and road network so that, for instance, timber may be moved to mills and markets. The rationalization of country grain elevators calls for a rearrangement in grain haulage patterns and often an increase in the length of journey from farm to delivery point. The size of the population and the general level of economic activity determines the volume of transportation movements and the need for upgrading of existing facilities.

Provision of Facilities

The trends in the location of activities in turn affect the decisions regarding the construction and improvement of roads. In particular, the increased use of trucks in rural and remote areas will necessitate the construction or improvement of secondary highways and resource roads.

For example, the growing use of longer haul forestry trucks will require the upgrading of secondary roads and roadway intersections. As a matter of course, many provincial highways will have to be reconstructed in the 1990s but technological advances will allow the replacement pavement to be stronger. It should be noted that all these decisions in the provision of facilities may have to be made in the context of reduced budgets. The province will have to establish priorities in upgrading the system and providing for new areas of growth.

Trips

It seems unlikely that the present distribution of trips among road, rail and air modes will alter appreciably. Each form of travel utilizes oil products as fuel so that all modes will be affected similarly if and when energy prices rise. But, if fuel economies can be achieved through modifications in design, or alternative sources of motive power developed commercially, the mix may change. In the intra-urban context, the demand for public transit may grow as the population ages.

Vehicle Design

The design of cars, trucks, trains and planes is likely to undergo continuous modification which may result in improved performance. The oil price shocks of the 1970s initiated a trend towards greater fuel efficiency which is likely to become even more pronounced should oil prices resume a steep upward path. There is also a trend towards faster and longer trucks as trucking firms respond to the increased competitiveness of rail transportation resulting from the adoption of new technology. However, there is a good probability that technological improvements to trucks will reduce the damage to pavement and improve safety as well as improving fuel economy.

Note: For further information on trends in transportation, please see the submission of the Department of Transportation and Utilities to the Compendium of Trends Selected by Agnecies of the Alberta Government, Technical Resource #3.

F. Housing

Housing

Projections by the Alberta Bureau of Statistics suggest that new household formation will grow annually over the next 30 years, although never matching the annual increments of the 1976–86 period. Furthermore, the proportion of all households in older age–groups will increase substantially; the households maintained (headed) by persons 45 years or over are forecast to rise from 41 percent in 1986 to 58 percent in 2016.

In the absence of rapid surges of economic activity, these trends imply that the volume of new housing production will be constrained. However, the types of housing constructed may have to be quite different from the variety marketed today. The growth of non–family households (i.e., consisting of people living alone or unrelated people living together), the aging of the population and the decreasing size of family units will likely increase the demand for small houses.

Renovation

The aging of the present housing stock will likely increase the need for renovation. Consequently, the level of construction activity may be somewhat greater than consideration of new housing construction alone would suggest.

A. Introduction

Canadians live in a representative democracy, under which the people rule indirectly through the election of representatives to govern them. Such an arrangement is typical of most western countries, whether the particular system of government is central or federal. In recent years, however, new ideas on the nature of governance (the manner of governing) have been developed in the United States: ideas which may already have influenced thinking in Canada.

This chapter outlines the concepts of "participatory democracy" and "anticipatory democracy" and then goes on to describe some possible effects of these trends.

B. Participatory Democracy

Participatory Democracy

In a political context, "participatory democracy" refers to government in which the public play a direct, continuing role, rather than merely electing representatives to govern on their behalf. The public may seek a greater degree of involvement if growth in bureaucracy and the power of governments has contributed to a feeling that decisions are no longer effectively influenced by the view of the government or elected representatives. In such a situation, the public may seek to extend its influence beyond the sanction of the electoral ballot box by playing an active part in government decision-making processes.

To date, the phenomenon of participatory democracy has been most evident in the U.S.A., where Naisbitt has identified a movement away from representative democracy to participatory democracy as a "megatrend". According to Naisbitt, instantaneous communications and high levels of education allow constituents to be as well informed as their representatives.

One response to demands for public participation has been the automatic inclusion of public hearings in many governmental decision-making processes. Although ultimately the elected representatives make the decision on the matter at hand, interest groups and members of the public have an opportunity to present their opinions explicitly.

There is a tradition in some local governments in North America of holding a town meeting intermittently to debate and/or vote on a variety of matters; in the age of the wired community, interactive push-button voting from the comfort of the home could be a more sophisticated means to the same end.

C. Anticipatory Democracy

"Anticipatory democracy" is defined by Toffler as "a process for combining citizen participation with future consciousness".

There is a growing interest in setting directions for societal action and government by direct citizen involvement.

Goal Setting

In his best selling book, Future Shock, Toffler suggested that a vision or integrated set of goals was needed to guide the formulation of solutions to actual or emerging social problems. This proposal was made in the face of the increasing complexity of modern life and the accompanying multiplication of goals within society. The alternative was continuing crisis-management. At the same time, the increasing social, cultural and political diversity of American society had resulted in growing societal heterogeneity and a dramatic widening of the variety of special interest groups.

The public development of an agenda for the future would constitute an exercise in "anticipatory democracy". However, Toffler envisaged that the goals compiled would be temporary direction indicators, intended to advise elected political, representatives. In the last resort, therefore, the implementation of policies to achieve collectively agreed upon goals could fall within the sphere of representative politics. The framework of goals which representatives would strive to achieve could be the responsibility of a "social future assembly" functioning separately from the legislative assembly.

Over the last 20 years approximately, a number of municipalities and some states in the United States have embarked upon futures programs whose purpose and content were inspired by the principles of anticipatory democracy; details of some of these programs are included in Technical Resource #1 The Discussion Guide in More Detail.

Among the benefits claimed for such programs are (i) the opportunity given to politicians to broaden the support for long-range actions that might not otherwise be acceptable; (ii) the opportunity for anticipatory democracy groups to review issues with a long time horizon and develop alternative approaches to major policy issues; (iii) the ability of the anticipatory democracy group to identify areas within government which should be reformed to make agencies and programs more suited to changing conditions and public preferences; and (iv) the receipt of feedback from the public when policies are being developed, not just when they are being implemented. Toffler's judgment on the programs was that they successfully raised consciousness but were weakened by the absence of any input to the budget process of governments.

SELECTED BIBLIOGRAPHY

Information sources which were helpful in preparing a number of chapters in this Guide are listed below under the heading "General". Sources which were specific to a particular chapter/section are listed by chapter/section title.

General

Alberta. Economic Development and Trade. Futures Compendium. The World Economy, 1990–2010: Multiple Scenarios. Edmonton, Alberta. 1987.

Alberta. Economic Development and Trade. Futures Compendium. An Update to the World Economy, 1990–2010: Multiple Scenarios. Edmonton, Alberta. 1988.

Alberta. Special Projects. Caring and Responsibility: A Statement of Social Policy for Alberta. Edmonton, Alberta. 1988.

Canada. Department of National Defence. Project 2010 – A Flight Plan for the Future: Phase 1 Report. Dobson, W.R. and Rowbottom, L.T. Ottawa, Ontario. 1985.

Naisbitt, J. Megatrends: Ten New Directions Transforming Our Lives. New York, New York: Warner Books. 1982.

Technology Beyond 2000

Bylinsky, G., "Technology in the Year 2000". Fortune, June 18, 1988.

Dagani, R., "Ceramic Composites Emerging as Advanced Structural Materials". Chemical and Engineering Week, February 1, 1988.

DeYoung, H.G., "Dawn of the BioTech Farm". High Technology, August 1987.

The Economist, "Office of the Future – A Survey". The Economist, July 12–18, 1986. 24pp.

————————, "The Genetic Mapping of Man". The Economist, February 20–26, 1988, 91–92.

————————, "The Genetic Alternative – A Survey". The Economist, April 30–May 6, 1988. 18pp.

Larson, E.D., Ross, M.H. and Williams, R.H., "Beyond the Era of Materials". Scientific American, June 1986.

Population and Social Trends

Alberta Treasury. Alberta Bureau of Statistics. Population Projections Alberta 1987–2016. Edmonton, Alberta. 1988.

Denton, F.T. and Spencer, B.G., "Population Aging and Future Health Care Costs in Canada". Canadian Public Policy, Summer 1983.

Snyder, D.P. "America's Future: Inevitable Forces for Change", pp. 35–45 in Oregon Commission on Futures Research, Emerging Trends: New Oregon Perspectives for the Year 2010. Salem, Oregon: Willamette University. 1986.

Statistics Canada. Population Projections for Canada, Provinces and Territories 1984–2006. Cat. no. 91–520. Ottawa, Ontario: Supply and Services Canada. 1985.

Education

Alberta Education. Planning and Policy Secretariat. Directions to 1990: Alberta Education's Four Year Plan 1987 to 1990. Edmonton, Alberta. 1987.

Alberta Education. Student Programs and Evaluation Division. Visions 2000: A Vision of Educational Technology in Alberta by the Year 2000. Edmonton, Alberta. 1987.

Health

Alberta. Community and Occupational Health. Moving into the Future for the Health of Albertans. Edmonton, Alberta. 1988.

Economic and Social Opportunities

Alberta. Economic Development and Trade. Communications and Information. Economic Diversification and the Class of 2000. Edmonton, Alberta. 1988.

Alberta. Energy Resources Conservation Board. Energy Requirements in Alberta: Supplementary Report 1988–2002. Report 88–C. Calgary, Alberta. 1988.

Alberta. Forestry, Lands and Wildlife. Forest Service. Alberta's Forests. Pub. no. 5/13. Edmonton, Alberta. 1988.

Alberta Report, "Transitions: Alberta's Emerging New Economy". Supplement to Alberta Report, April 18, 1988.

Davies, W.K.D. A Spatial Analysis of Service Centres in Alberta, 1986: Part II – Changes in the Commercial Importance of the Service Centres in Alberta, 1977–85. Research and Development Branch, Planning Services Division. Edmonton, Alberta: Alberta Municipal Affairs. 1987.

Wishard, W.V.D., "The 21st Century Economy". The Futurist, May–June 1987, 24–25.

The Environment

Arthur, L.M., "The Implication of Climate Change for Agriculture in the Prairie Provinces". Climate Change Digest, CCD 88–01. Ottawa, Ontario: Environment Canada. 1988.

Brown, L.R., Flavin, C. and Wolf, E.C., "Earth's Vital Signs". The Futurist, July–August 1988.

The Economist, "Taking the World's Temperature". The Economist, July 9–15, 1988, 80.

National Task Force on Environment and Economy. Report of the National Task Force on Environment and Economy. Downsview, Ontario: Canadian Council of Resource and Environment Ministers. 1987.

The World Commission on Environment and Development (the Brundtland Commission). Our Common Future. Oxford, England: Oxford University Press. 1987.

Worldwatch Institute. State of the World 1988. New York, New York: W.W. Norton and Co. 1988.

Major Municipal Responsibilities

Walchuk, W. Alberta's Local Governments: People in Community Seeking Goodness. Municipal Administrative Services Division. Edmonton, Alberta: Alberta Municipal Affairs. 1987.

Politics and Government

Baker, D.E. "State, Regional and Local Experiments in Anticipatory Democracy: An Overview", pp. 5–34 in Bezold, C. (ed.), Anticipatory Democracy: People in the Politics of the Future. New York, New York: Vintage Books, 1978.

Masson, J. Alberta's Local Governments and their Politics. Edmonton: Pica Pica Press, 1985. See Ch. 12: "The Future".

Toffler, A. Future Shock. New York, New York: Bantam Books. 1971.

Toffler, A. "Introduction on Future–Conscious Politics", pp. xi–xxii in Bezold, C. (ed.),Anticipatory Democracy: People in the Politics of the Future. New York New York: Vintage Books, 1978. See p. xii.